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SHORT TERM EFFECTS OF A FRESHWATER DISCHARGE ON THE BIOTA OF ST. LUCIE ESTUARY, FLORIDA

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By

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**South Florida Water Management District
Resource Planning Department
Environmental Sciences Division**

EXECUTIVE SUMMARY

The productivity of the St. Lucie Estuary is influenced by the salinity regime in the system and is frequently altered by the rapid introduction of fresh water runoff. The most dramatic alterations in salinity occur during regulatory discharges from Lake Okeechobee into the South Fork of the estuary. For the duration of these discharges, salinities are reduced far below normal.

Limited data concerning the environmental effects of regulatory discharges on the St. Lucie Estuary were available before 1977 and the District began investigations to document changes in the fish and benthic communities and water quality during controlled discharges. Results from these investigations will ultimately provide the basis for development of methods and procedures that will be sensitive to the ecology of the estuary. Results of a previous study indicated that a controlled three week 1000 cfs discharge had no significant effect on biota; however, this study demonstrated substantial changes in the composition and abundance of benthos and distribution of fish as the result of a three week 2500 cfs discharge.

Salinity and bottom substrate are important environmental factors that affect fish and benthic communities. Before the 2500 cfs discharge began, the inner estuary had a salinity of 5 to 18 ppt and the middle estuary had a salinity of 18 to 30 ppt. Within these two areas, organically rich mud bottoms were inhabited by a high density but low diversity of estuarine benthos. The fish community had little diversity and was dominated by lower trophic level fish, especially bay anchovies. In contrast, sand and shell substrates with seagrasses that occurred in more saline (30 to 36 ppt) waters of the outer estuary, provided habitat for diverse populations of estuarine and marine benthos and fish.

Salinity throughout the estuary was altered by the 2500 cfs discharge. Within the first two weeks of discharge, salinities in the inner and middle estuary were reduced to 0.5 to 5.0 ppt (oligohaline). At the outer limits of this low salinity zone, a salt wedge occurred that remained relatively stable for the duration of the discharge.

The initial reduction in salinities and increase in turbidity in the inner and middle estuary changed the benthic and fish communities. The most apparent changes to benthos occurred where salinity was reduced below 5 ppt during the first two weeks of discharge. The majority of a 44% reduction in the number of benthic organisms resulted from a severe decrease in numbers of the bivalve, *Mulinia lateralis*, which perished from low salinities, and the amphipod, *Ampelisca abdita*, which migrates when stressed by salinity and/or increased turbidity. However, a dramatic increase in abundance of the fresh water midge larvae, *Chironomus crassicaudatus* and a moderate

increase in numbers of the polychaete, *Streblospio benedicti* occurred. Six fresh water species were introduced to the inner estuary and four estuarine species were lost or severely reduced in numbers.

The composition and distribution of fish changed with the decline in salinity. Gizzard shad, white catfish, mosquito fish, and black crappie are fresh water species that moved into the inner estuary from upstream. The euryhaline larvae of ladyfish, tarpon, and bonefish, and adult snook moved into the South Fork of the inner estuary from downstream. Several species such as the striped anchovy, pinfish, and pigfish, which are less tolerant of low salinities, avoided the inner estuary. In addition to the above noted fish movements, one other prominent change occurred. The fish occupying the lower trophic level in the inner estuary became more uniformly distributed as the area of low salinity increased during the initial two weeks of discharge. A surge of inorganic nitrogen, which occurred at the onset of the discharge, resulted in an algae bloom that may have provided an additional food supply for planktivorous fish. The dispersion and availability of food organisms, including *A. abdita* and *C. crassicaudatus*, and organic materials may have been responsible for the increased distribution of these fish. The lower trophic level fish returned to their previous distribution in the estuary after the low salinity zone was established and most of the changes in the benthic communities had apparently taken place. In spite of the observed movements of some species, the fish communities (as represented by species presence throughout the estuary), remained stable throughout the five-week experimental discharge.

Under natural conditions the size of the low salinity zone in the St. Lucie Estuary fluctuates in response to seasonal freshwater runoff from the watershed. Many benthic organisms have adapted to transient, low salinity conditions that occur in the inner estuary but cannot tolerate exposure to fresh water for extended periods. The three week, 2500 cfs discharge rapidly increased the size of oligohaline zone to include a large portion of the middle estuary and induced changes in the fish and benthic communities that normally occur in a limited area of the inner estuary. Subsequent modeling studies indicated that if the discharge had continued for another 10 days the inner estuary would have become fresh water and threatened the survival of existing oyster reef communities. Previous regulatory discharges have been large enough and long enough to create fresh water conditions in the middle estuary for extended periods. The loss of oysters in the inner and middle estuary would decrease the carrying capacity of the system since these organisms provide an important food source and habitat for many other organisms.

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Introduction

The St. Lucie Estuary is an important ecological resource that many aquatic species utilize for part or all of their life history. Almost 65 percent of the commercial fish and most of the sport fish in the South Atlantic Estuarine area are dependent on systems similar to the St. Lucie Estuary for one or more phases of their development (Bollman, 1975).

Salinity is an important factor in estuaries because it influences the presence, distribution, abundance, rate of development, and ultimately the survival of many organisms. For these reasons, the rate and magnitude of change in the salinity gradient throughout the year affects the overall productivity of the estuary. The salinity gradient in the St. Lucie Estuary has been altered in several ways. Canals have been dredged in the basins that drain into the North Fork to provide flood protection and irrigation for agriculture and urban development. These canals discharge storm-water into the estuary much faster than would normally occur; therefore, salinity can be altered rapidly. The St. Lucie Canal, which provides a drainage outlet for Lake Okeechobee, flows into the southern reaches of the South Fork. Regulatory discharges are made periodically from Lake Okeechobee when water levels exceed the flood control schedule developed and implemented by the Army Corps of Engineers and the South Florida Water Management District (SFWMD). These large volume regulatory discharges lower the estuarine salinity gradient far below the normal range for the duration of the discharge. The environmental effects associated with the timing, duration, rate, and quality of water released during these discharges have concerned local citizens, interest groups, and the SFWMD. Major concerns are related to the effects of lowered salinity and increased sediment load on the biota and physical characteristics of the estuary.

The St. Lucie Estuary has received regulatory discharges from Lake Okeechobee since the completion of the St. Lucie Canal (C-44) in 1924. This canal was enlarged in 1949 and freshwater discharges of near 6000 cfs occurred many times. The lake regulation schedule was raised in 1974 and provided more water storage capacity which decreased the amount of water discharged to tide-water. However, in spite of this change, a large regulatory discharge of about 6700 cfs occurred for two weeks in August 1974.

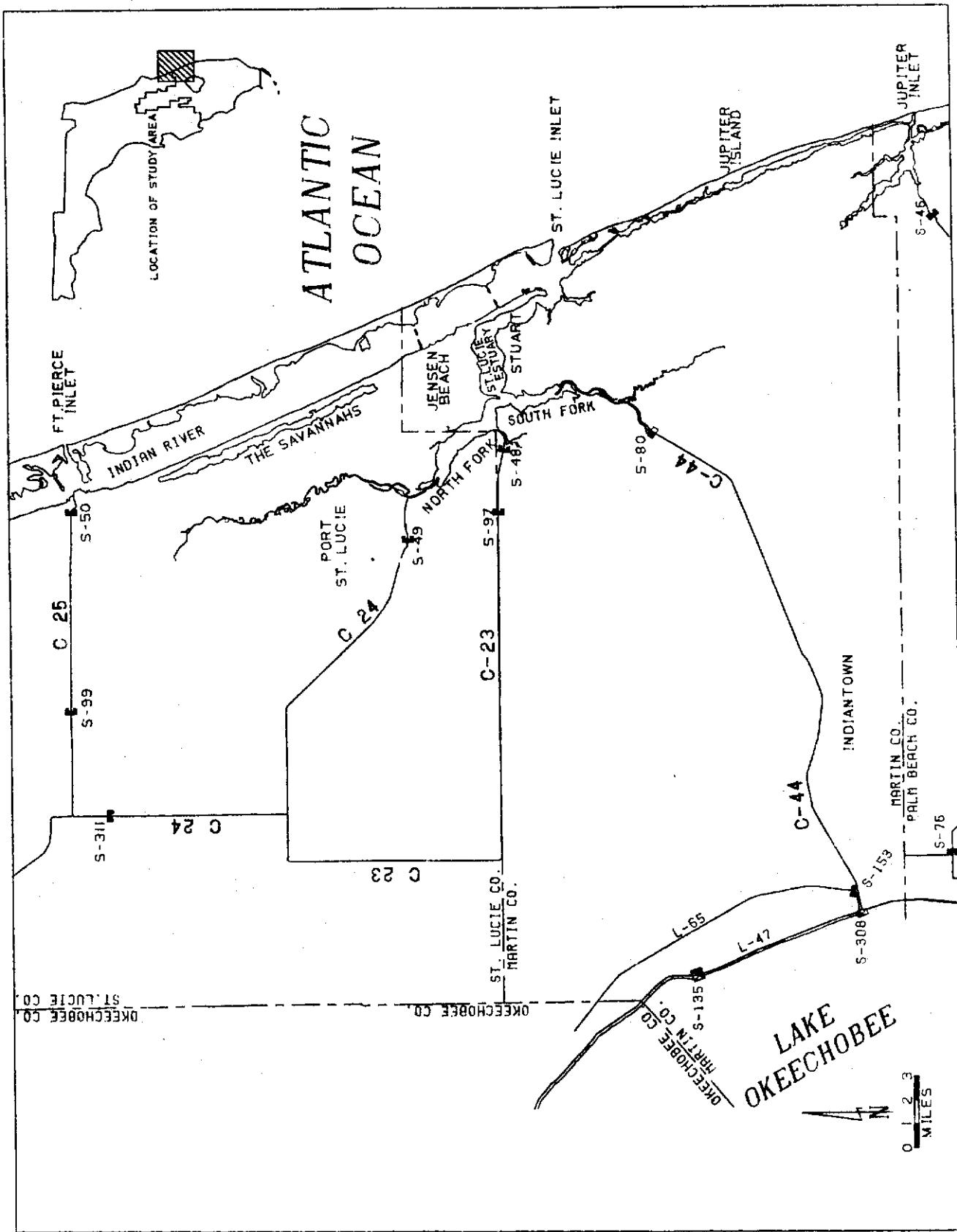
A limited amount of past research was completed which documented some of the effects of discharges on the fish and benthic algae populations of the estuary (Gunter, 1959; Phillips and Ingle, 1960; Springer, 1960; Phillips, 1961; Heald, Iverson, and Berkeley, 1972). These studies, however, were not experimentally designed to document the environmental changes that occurred during a controlled discharge, lasting for a predetermined amount of time. To provide more detailed information, the SFWMD, in cooperation with the Army Corps of Engineers, began investigations which monitored the effects of controlled freshwater releases from Lake Okeechobee on the biota and water quality of the St. Lucie Estuary. A study of the effects of a three week, 1000 cfs discharge in June and July 1977 indicated there were no significant changes in the benthic and fish populations (Haunert and Startzman, 1980); therefore, the estuary had not been subjected to discharges in excess of 1000 cfs since August 1974.

Biological conditions within the estuary were probably representative of the "steady state" conditions before a study of a three-week, 2500 cfs controlled discharge began in June 1978. This study documents that significant changes occurred in the distribution of benthos and fishes in the estuary during this controlled discharge event.

Description of Study Area

The St. Lucie Estuary is located in Martin and St. Lucie Counties on the southeast coast of Florida (Figure 1). Annual rainfall averages about 50 in. with most of this rainfall occurring from May to October. Maximum rainfall events generally occur in September. Citrus and improved pasture are the major land uses in the watershed, but recently urban development has increased. Canals C-23 and C-24 drain numerous smaller canals and have a combined drainage basin area of 333 mi². These two canals discharge surface water runoff into the North Fork of the St. Lucie Estuary at structures S-48 and S-49 (Figure 1). Since the completion of the Port Mayaca structure (S-308) on Lake Okeechobee in 1978, runoff from the C-44 basin (189 mi²) is discharged through the St. Lucie Lock and Dam (S-80) into the South Fork of the estuary when S-308 is closed. The St. Lucie Estuary watershed (Figure 2) also includes the Tidal St. Lucie and North St. Lucie Basins (68 and 189 mi²) and several smaller basins (4, 5, and 6).

The estuary has been divided into four major areas for the purpose of this study: the North and South Forks (collectively termed the inner estuary); the mid-estuary; and the outer estuary. The main body of the North Fork is about four miles long, has a surface area of 4.5 mi², and a total volume of 998.5×10^6 ft³ at mean sea level. The center of the North Fork is approximately 10.0 ft deep, and depth increases to 15.0 ft at the confluence with the South Fork (Figure 3). The South Fork has about half the surface area and volume of the North Fork (1.9 mi² and 468.7×10^6 ft³). Depths within the South Fork exceed 9.0 ft in the navigation channel but are relatively shallow outside the channel, especially in the vicinity of the Palm City Bridge (Figure 4). The mid-estuary begins at the Roosevelt Bridge, extends east for three miles and "dog-legs" to the southeast for two miles until it is constricted at Hell Gate Point. The surface area and volume of the mid-estuary are similar to the North Fork (4.7 mi² and 972.7×10^6 ft³). At Roosevelt Bridge, depths of 20.0 ft occur with a cross section of only 1000 ft. This sharp relief is contrasted by the gradual depth changes which occur east of the bridge to Hoggs Cove, where maximum depths are similar to the North Fork (10.0 ft) across an average distance of 6000 ft. From Hoggs Cove to Hell Gate Point, the maximum depths increase from 10.0 ft to a small area that has a depth of 26.0 ft. The cross-sectional area at Hell Gate Point (16,750 ft²) is almost identical to the cross-section at Roosevelt Bridge (16,650 ft²). From Hell Gate Point, water flows into the outer estuary past the Manatee Pocket to the Crossroads, and meets with the Indian River and Intracoastal Waterway producing complex tidal currents near the St. Lucie Inlet.



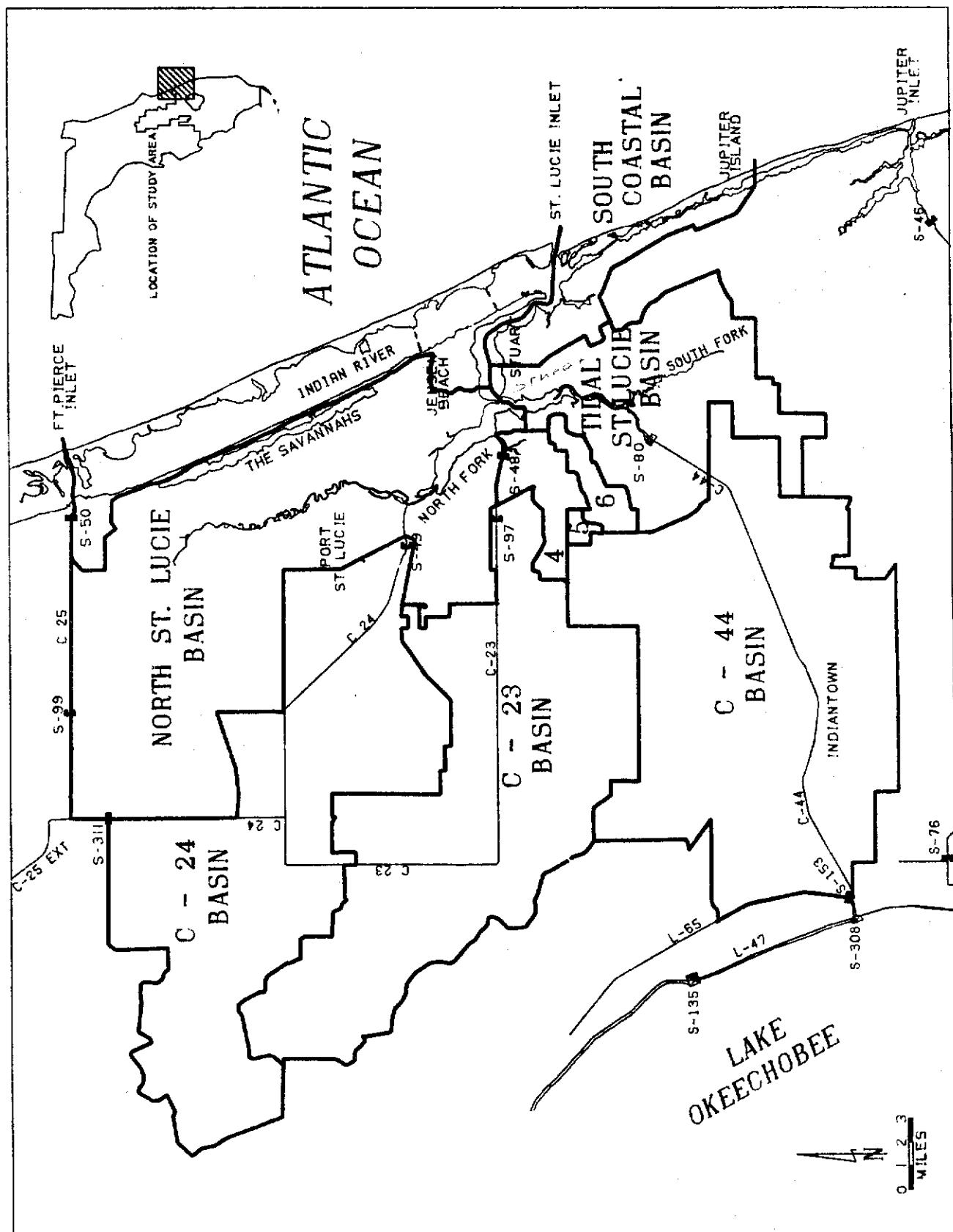


FIGURE 2. ST. LUCIE ESTUARY DRAINAGE BASINS

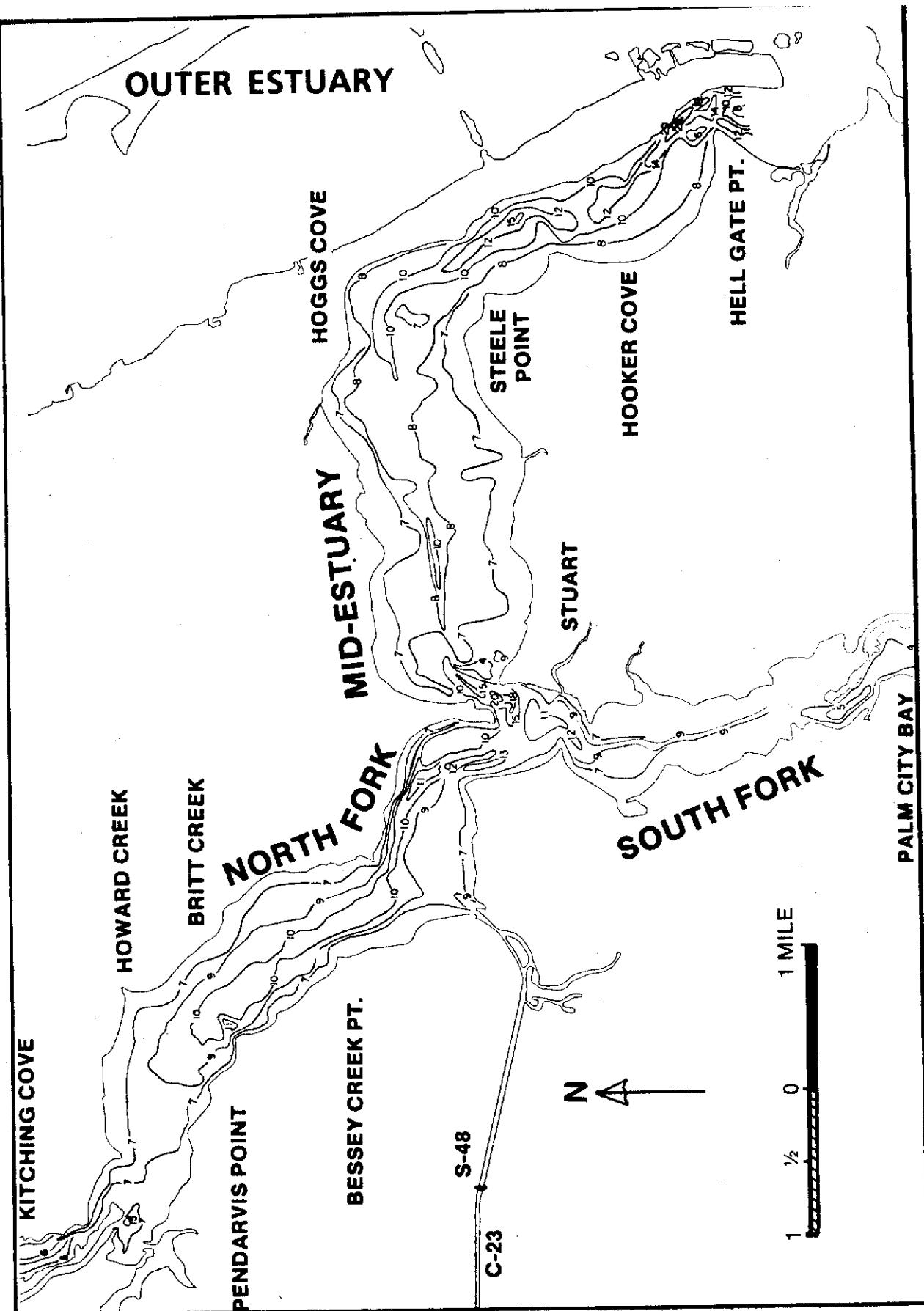
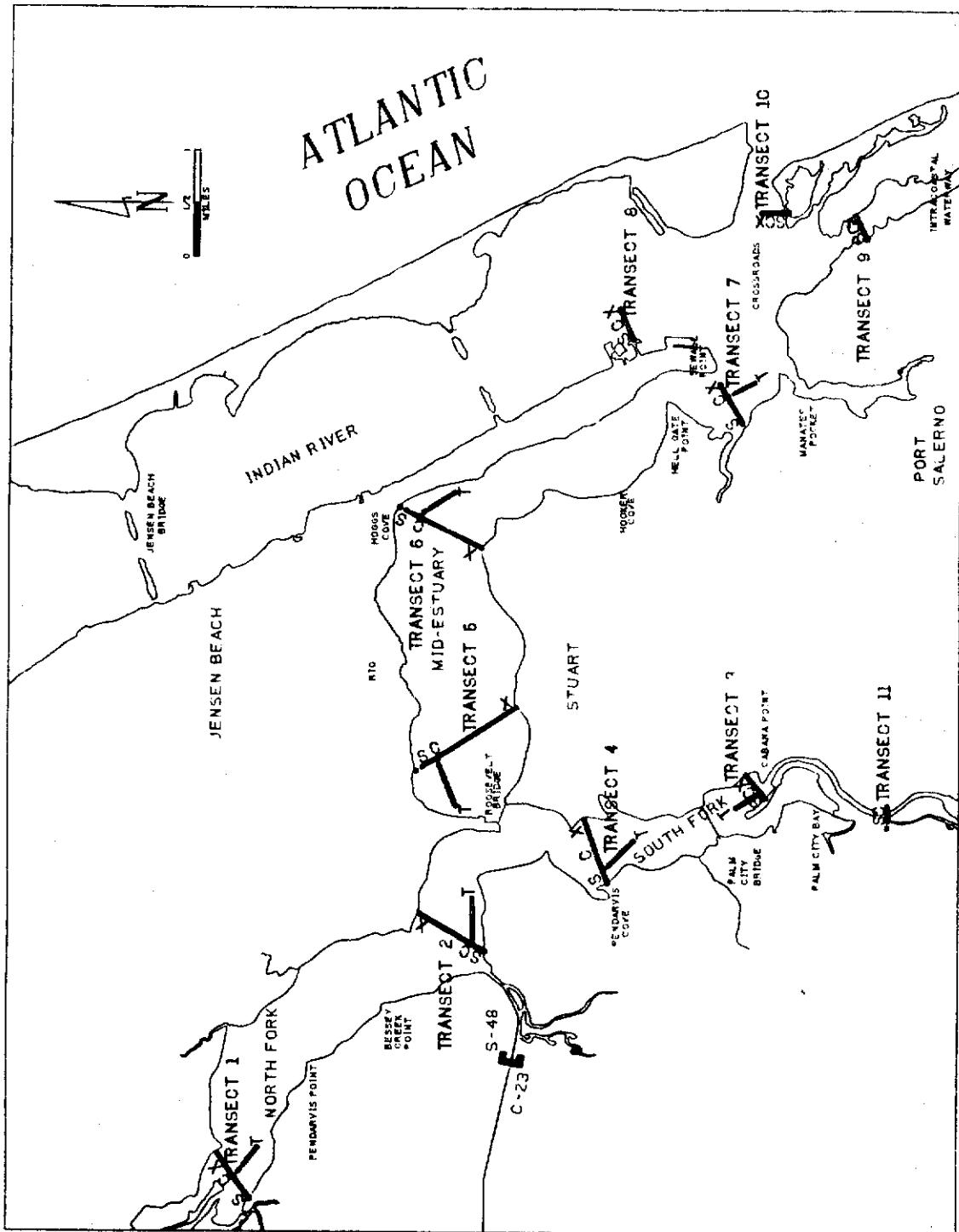


FIGURE 3. BATHYMETRY (in Ft.) OF ST. LUCIE ESTUARY, FLORIDA IN 1981

FIGURE 4. ST. LUCIE ESTUARY SAMPLING TRANSECTS



Sampling Methods

A 2500 cfs controlled freshwater discharge from the St. Lucie Lock and Dam (S-80) into the South Fork of the St. Lucie Estuary was made from 19 June to 10 July 1978. Changes in the salinity gradient, water quality, fish, and benthic communities were monitored to ascertain the effects of the discharge. Samples were taken from one week before the discharge began to four days after it ended. Eleven transects were established throughout the estuary with three sample sites (S,C,X) on each transect (Figure 4).

Physical Parameters

Low and high tide measurements of conductivity (which is directly related to salinity), dissolved oxygen, and temperature were taken every week at each "C" (mid-channel) site at 0.5 m depth intervals with a Hydrolab Surveyor Model 6D. Studies lasted for about three hours, began at slack tide in the St. Lucie Inlet (station 10C), and proceeded upstream to the inner estuary. Since there was approximately a three hour time lag for slack tide between the outer and inner estuary, it was possible to obtain near slack tide measurements at most sample locations.

Water Quality

Surface turbidities were monitored twice a week at "C" sites during the latter part of the outgoing tide. Jackson Turbidity Units (JTU) were determined with a Hach Laboratory Turbidimeter Model 1960A. Triplicate water quality samples were taken directly upstream of S-80 twice a week. Samples were collected about 15 cm below the surface to avoid organic surface film. Analyses were completed for nutrients (ammonia N, nitrite N, nitrate N, and orthophosphorus) using methods outlined in APHA Standard Methods, 14th Edition.

Benthic Macroinvertebrates

Benthic macroinvertebrates were sampled at three locations (S, C, and X) along transects 1 to 10. Two benthic grabs with a standard Ekman dredge (232 cm²) were combined at each station. Samples were taken on 13 June, six days prior to the discharge, and on 10 July, the final day of discharge. The substrate was described before the sample was rinsed with water through a 841 micron pore size, A.S.T.M. standard sieve. Organisms retained in the sieve were rinsed into a glass container and preserved and stained with 10% formalin, 0.025% rose bengal solution. Dissolved oxygen, specific conductance, and temperature were measured near the bottom at the time of sampling.

Fish

Fish species composition in the estuary was sampled weekly for five weeks (before, during, and after the discharge) at eighteen locations during the study. A 7.6 m seine with 3.2 mm mesh was towed along two previously marked 15 m sections of shoreline at each of the eleven "S" locations. In addition, a 4.9 m flat otter trawl with a 12.7 mm bar mesh wing and a 6.4 mm bar mesh tail was towed behind a boat at about three knots for ten minutes along the seven "T" lines depicted in Figure 4. Large fish specimens were identified, measured and released while the remainder of the sample was preserved in a 10%

formalin solution. Temperature at the surface was measured at the time of sampling with a hand-held thermometer and read to the nearest 0.1°C. Surface salinity was measured using a temperature compensated refractometer, read to the nearest 0.5 ppt. The refractometer was referenced to standard solutions for calibration.

Field Observations

In addition to sampling water and biota, field observations of unusual events were documented. The response of oysters to the discharge was observed. Several clusters of adult oysters (*Crassostrea virginica*) were collected in the inner estuary and placed in shallow water at station 4S. Each week when seine samples were collected at station 4S the condition of the oysters was noted.

Statistical Methods

Stratification coefficients were calculated for salinity by dividing the mean of the vertical profile by the reading taken at the 0.5 m depth (Van de Kreeke, J. and J.D. Wang, 1976).

Salinity distributions are illustrated by use of a Synagraphic Mapping System (SYMAP), a computer program that constructs concentration gradients to spatially illustrate parameter values (Dougenik and Sheehan, 1975).

Percent presence and total relative abundance of benthic macroinvertebrates were determined using a modification of the methods of Walker and Bambach (1974). Percent presence was calculated as the number of sites at which a species occurred divided by the total number of sites. Total relative abundance is the number of individuals of one species divided by the total number of individuals of all species, and is expressed as a percentage. Chi square analysis at 95% confidence level was used to test the difference between the two sets of benthic samples using the percent presence and the relative abundance.

Similarity and change in benthic species composition were examined by an index of similarity (Odum, 1971) and by a related index of percent difference (Sorenson, 1948). Species diversity was determined with Shannon-Weiner Species Diversity Index \log_2 (Shannon, 1963).

The percent presence of the 33 fish that were most often captured before the discharge were compared with the percent presence of these same fish species after the discharge began. Chi square analysis at 95% confidence level was used to find differences among the five sets of samples for fishes at the lower trophic level. The number of fish species captured at each station throughout the study were tested for homogeneity of variance using Bartlett's test and a F max-test at the 95% confidence level. Significant differences among the number of species captured were determined with a t-test at the 95% confidence level (Sokal and Rohlf, 1969).

A cluster analysis was performed on fish presence-absence data for the seine and trawl samples (Pinkham and Pearson, 1976).

Results

Hydrology

Measured sources of freshwater inflow into the inner estuary were rainfall and discharges from three structures. A controlled discharge of 2500 cfs at S-80

in the South Fork began on 19 June 1978 and continued for 22 days until 10 July 1978. Discharges of much lower volumes were periodically made from C-23 and C-24 during the study period. A comparison of the average basin rainfall (Figure 5) with the discharge records (Figure 6) demonstrates the response of the structures to storm runoff. By comparison, discharges from S-80 provided the greatest amount of fresh water and therefore had the greatest impact on the physiochemical character of the estuary.

Salinity

A salinity gradient of 11 to 33 ppt existed in the St. Lucie Estuary from S-80 to the inlet on 15 June, four days before the discharge began. Fresh water tributary flow and insufficient mixing caused a slight stratification of salinity in the South Fork (Figure 7A).

After one day of discharge, salinities in the area from S-80 to the Palm City Bridge were reduced to almost fresh water. Downstream, near the Roosevelt Bridge (station 4), a freshwater lens over brackish water existed. This highly stratified area (stratification coefficient of 4.0) was between the well mixed fresh water in the South Fork and salt water in the outer estuary that had stratification coefficients near 1.0 (Figure 7B). After day one, salinities in the North Fork (Table 1) were only slightly reduced by about 5 ppt at Coconut Point (station 2).

TABLE 1. SALINITY (ppt) AT LOW TIDE IN THE NORTH FORK DURING THE 2500 CFS DISCHARGE STUDY

Station	Date	Mean	Min.	Max.	S.C.*
1C	6/15	10.9	10.2	12.7	1.05
	6/20	11.8	11.1	12.4	1.03
	6/27	3.0	2.0	4.8	1.35
	7/7	1.2	1.2	1.2	1.04
	7/12	0.9	0.8	0.9	.96
	7/20	2.0	1.8	3.1	1.14
2C	6/15	16.3	14.3	20.1	1.06
	6/20	11.7	8.3	14.5	1.30
	6/27	6.0	3.1	16.8	1.95
	7/7	1.8	1.5	2.0	1.12
	7/12	1.3	1.3	1.5	1.05
	7/20	4.3	4.2	4.3	1.05

*S.C. = stratification coefficient

After eight days of discharge, salinities in the North Fork were reduced by discharges from S-48 and S-80 (Table 1) and salinities within the mid-estuary had dropped as a result of less dense water (about 6 ppt) moving out of the inner estuary (Figure 8A). Increased stratification and reduced salinities at the St. Lucie Inlet (station 10), station 8 in the Indian River, and station 9 in the Intracoastal Waterway showed that the outer estuary was just beginning to respond to the 2500 cfs discharge after eight days of flow (Figure 8A and Table 2).

Figure 8B represents the gradient after 18 days of discharge (7 July). The inner estuary was almost entirely fresh water and a well-defined salt wedge had formed in the mid-estuary. Salinity measurements at the St. Lucie Inlet were significantly lower than after

TABLE 2. SALINITY (ppt) AT STATIONS 8C AND 9C DURING THE 2500 CFS DISCHARGE STUDY

Sta.	Date	Mean	Min.	Max.	S.C.*	Tide Study
8C	6/15	33.7	32.1	39.1	1.05	Low
	6/16	34.9	34.5	34.8	1.00	High
	6/20	33.4	33.5	33.5	1.00	Low
	6/22	33.2	30.8	34.4	1.05	High
	6/27	37.9	35.3	39.3	1.02	Low
	6/29	26.8	24.1	30.2	1.10	High
	7/6	28.1	15.6	29.5	1.00	High
	7/7	24.9	23.9	25.5	1.03	Low
	7/10	32.2	29.5	32.8	1.00	High
	7/12	24.8	24.5	24.9	1.00	Low
	7/20	29.2	29.2	29.5	1.00	Low
9C	6/15	31.6	31.4	31.8	1.00	Low
	6/16	32.4	32.2	32.4	1.00	High
	6/20	29.8	28.8	30.2	1.00	Low
	6/22	29.5	29.4	29.5	1.00	High
	6/27	34.3	30.5	38.1	1.10	Low
	6/29	20.0	18.6	21.4	1.10	High
	7/6	26.1	19.5	31.4	1.26	High
	7/7	19.8	12.3	25.5	1.16	Low
	7/10	21.6	15.3	29.1	1.34	High
	7/12	18.6	13.3	22.2	1.24	Low

*S.C. = stratification coefficient

eight days, indicating that discharges were no longer being retained within the inner and mid-estuary.

Releases from S-80 ceased on 10 July 1978. Two days after discharges had ceased (Figure 9A), salinities and the amount of stratification were very similar throughout the system to those found on 7 July, three days before the discharge stopped. One additional salinity study was completed on 20 July, 10 days after the discharge stopped (Figure 9B), and showed that the system had returned to an almost linear salinity gradient with moderate stratification in the South Fork. This gradient, however, was lower than the gradient that existed before discharges began.

Dissolved Oxygen (D.O.)

Dissolved oxygen concentrations were highly stratified in the inner and middle estuary prior to the discharge (Figure 10A; Table 3), whereas the oxygen concentrations exhibited a more uniform distribution throughout the water column in the outer estuary. After one day of controlled releases and for the rest of the discharge period, the waters from S-80 to the Palm City Bridge were no longer stratified but were well mixed and highly oxygenated (Figures 10B to 11B). Following 18 days of S-80 releases, an obvious zone of oxygen depletion ("D.O. sag") had developed at station 6 showing comparatively low mean and bottom D.O.'s due to sustained salinity stratification (Figure 11B). However, outer estuary stations 8 and 9 had relatively high D.O.'s and were well mixed. The North Fork primarily had high oxygen concentrations and stratified conditions throughout the study (Table 3). In the South Fork, two days after the discharge stopped, the vertical D.O. concentrations remained high but were less uniform than during the discharge. Ten days after the discharge, however, the D.O. distribution in the water column returned to the

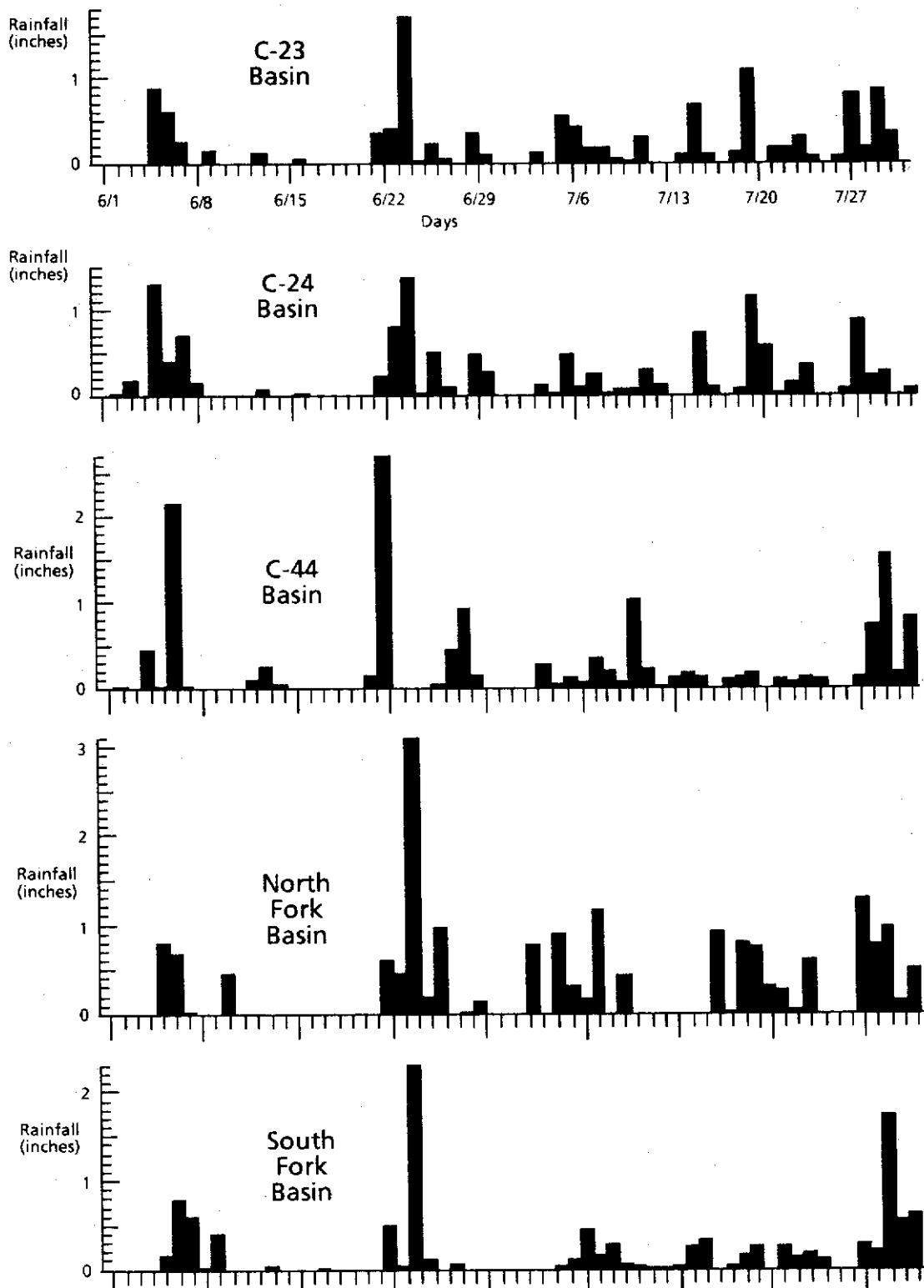


FIGURE 5. RAINFALL IN TRIBUTARY BASINS OF THE ST. LUCIE ESTUARY, JUNE-JULY, 1978

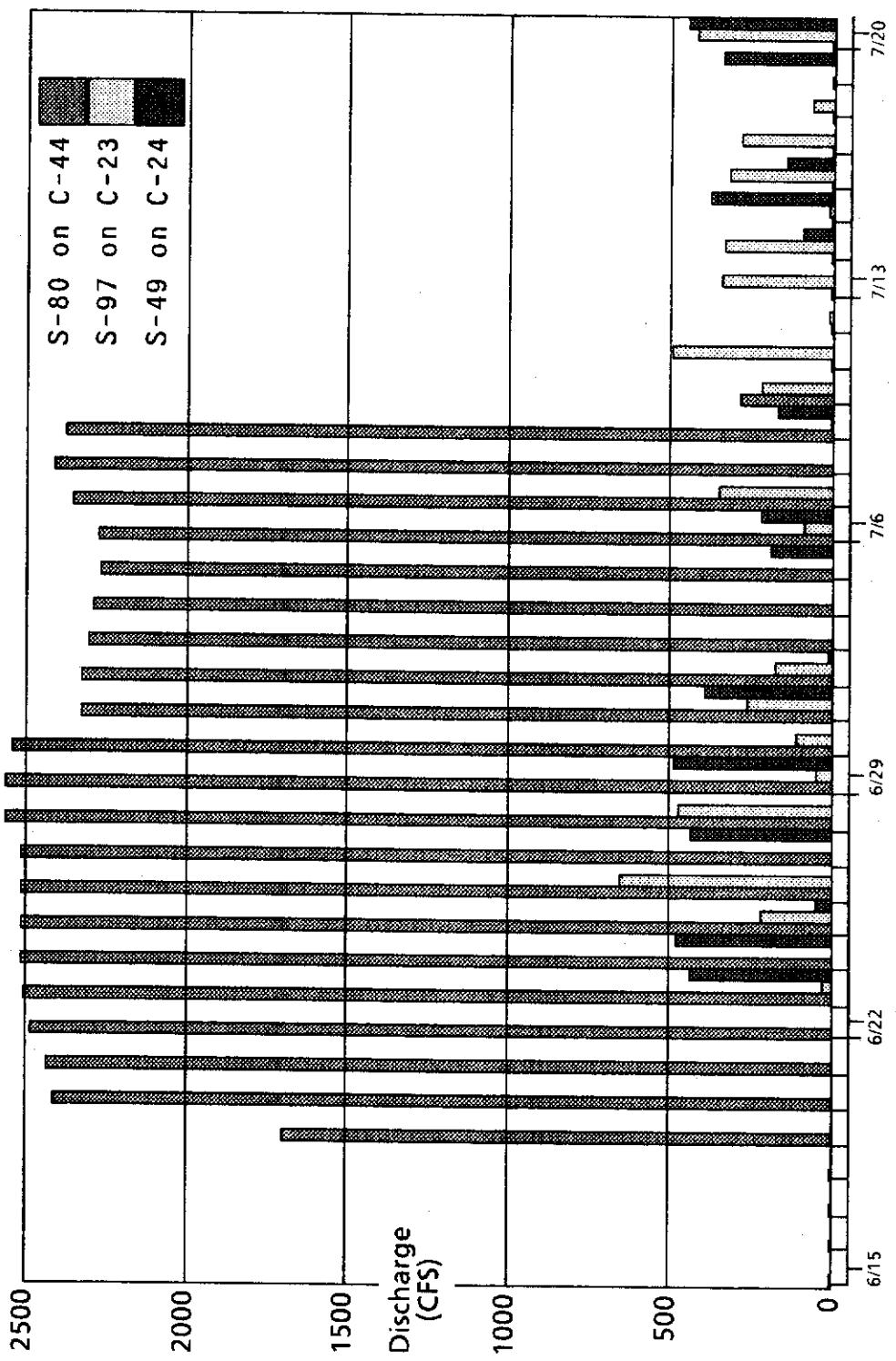
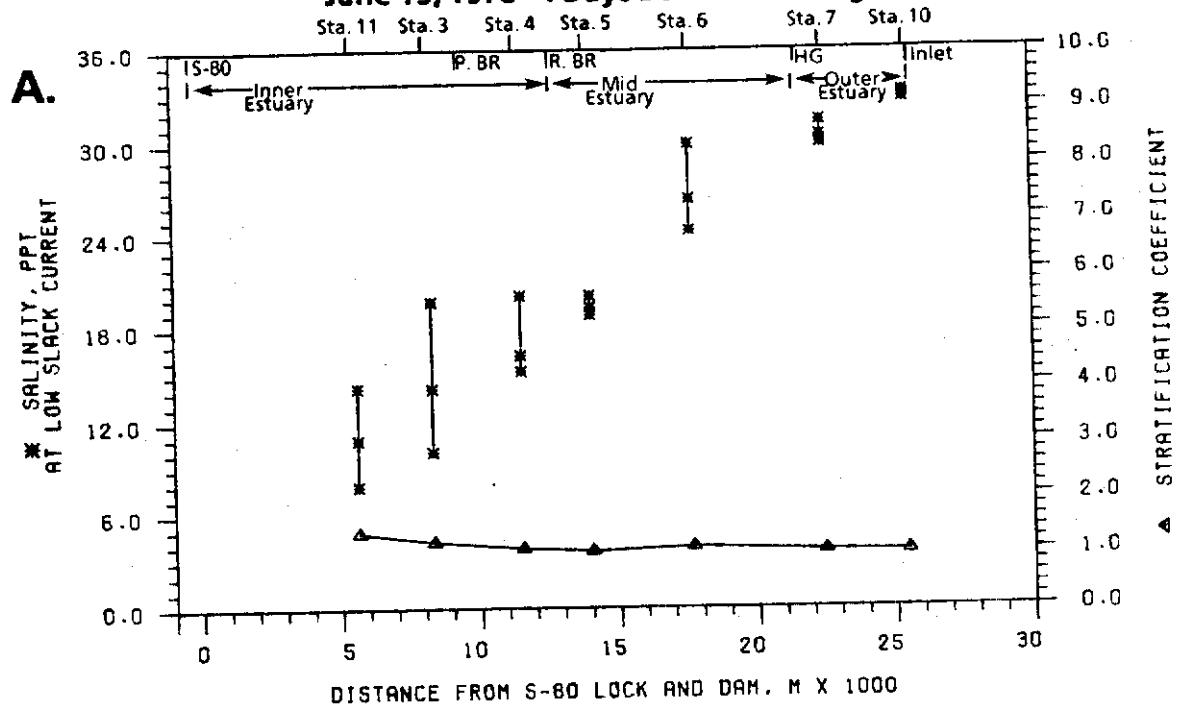
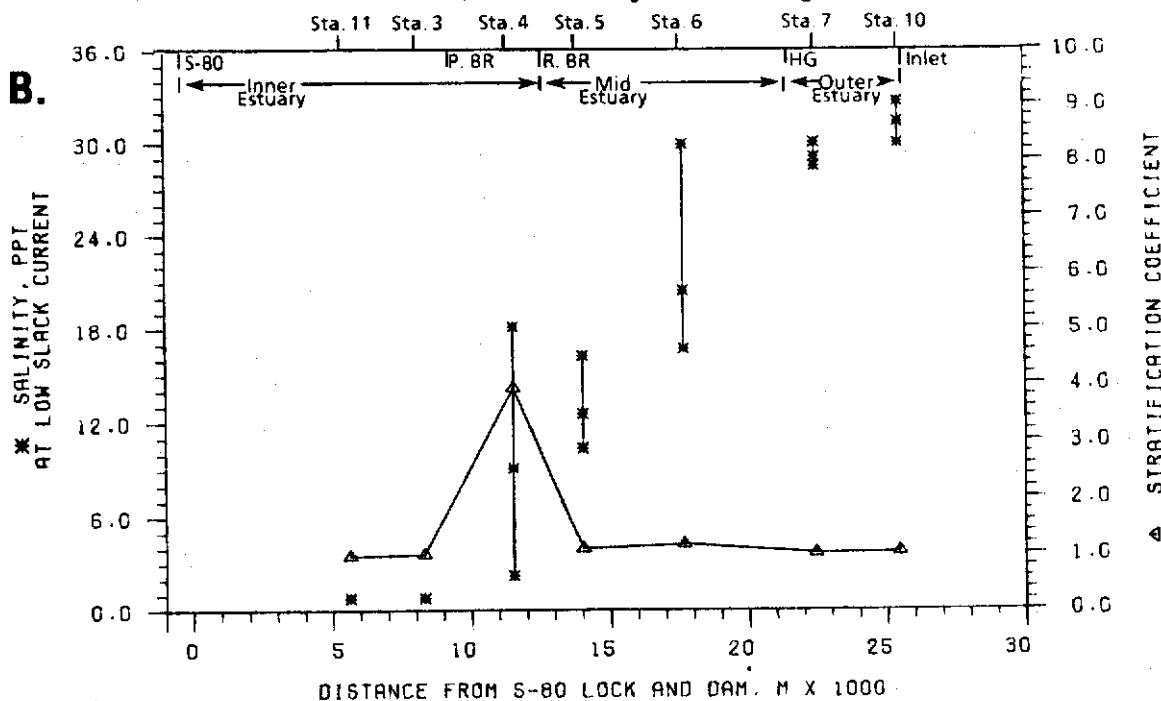


FIGURE 6. DISCHARGES INTO THE ST. LUCIE ESTUARY 6/15/78 THRU 7/20/78

June 15, 1978--4 Days Before Discharge



June 20, 1978--1 Day of Discharge



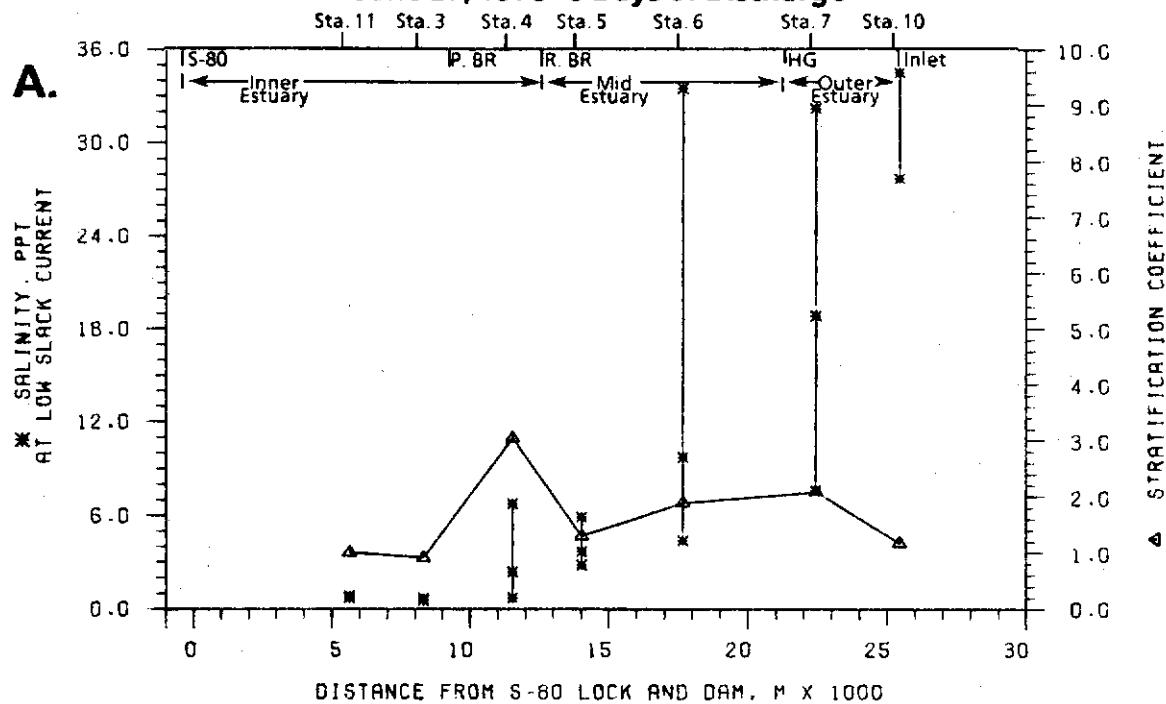
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K BR Kellstadt Bridge	R BR Roosevelt Bridge
P BR Palm City Bridge	HG Hellgate

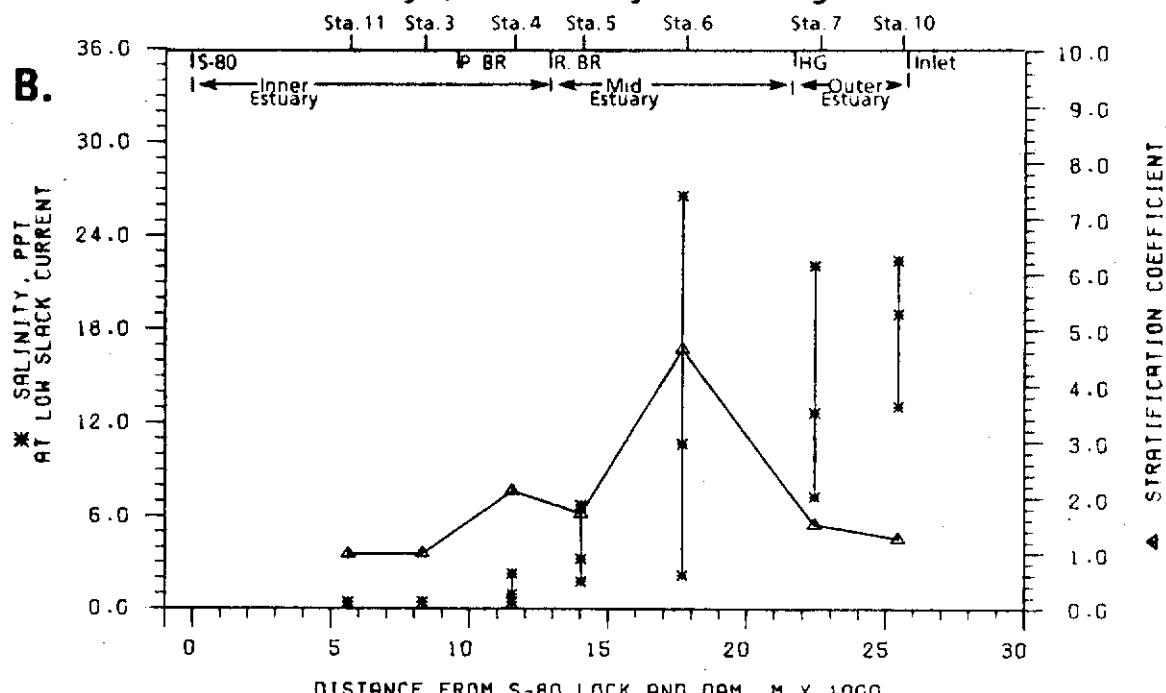
Maximum
 Mean
 Minimum

FIGURE 7. SALINITIES AND STRATIFICATION COEFFICIENTS IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

June 27, 1978--8 Days of Discharge



July 7, 1978--18 Days of Discharge



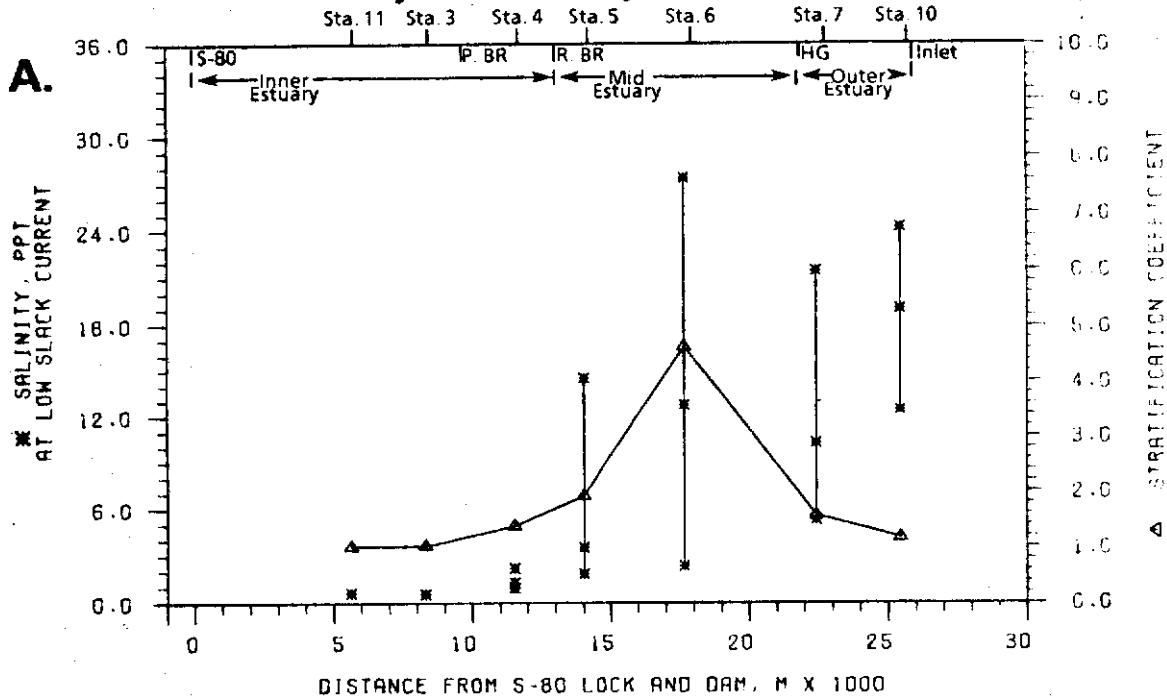
KEY

KBR Kellstadt Bridge	RBR Roosevelt Bridge
PBR Palm City Bridge	HG Heligate

* Maximum
 * Mean
 * Minimum

FIGURE 8. SALINITIES AND STRATIFICATION COEFFICIENTS IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

July 12, 1978--2 Days Post Discharge



July 20, 1978--10 Days Post Discharge

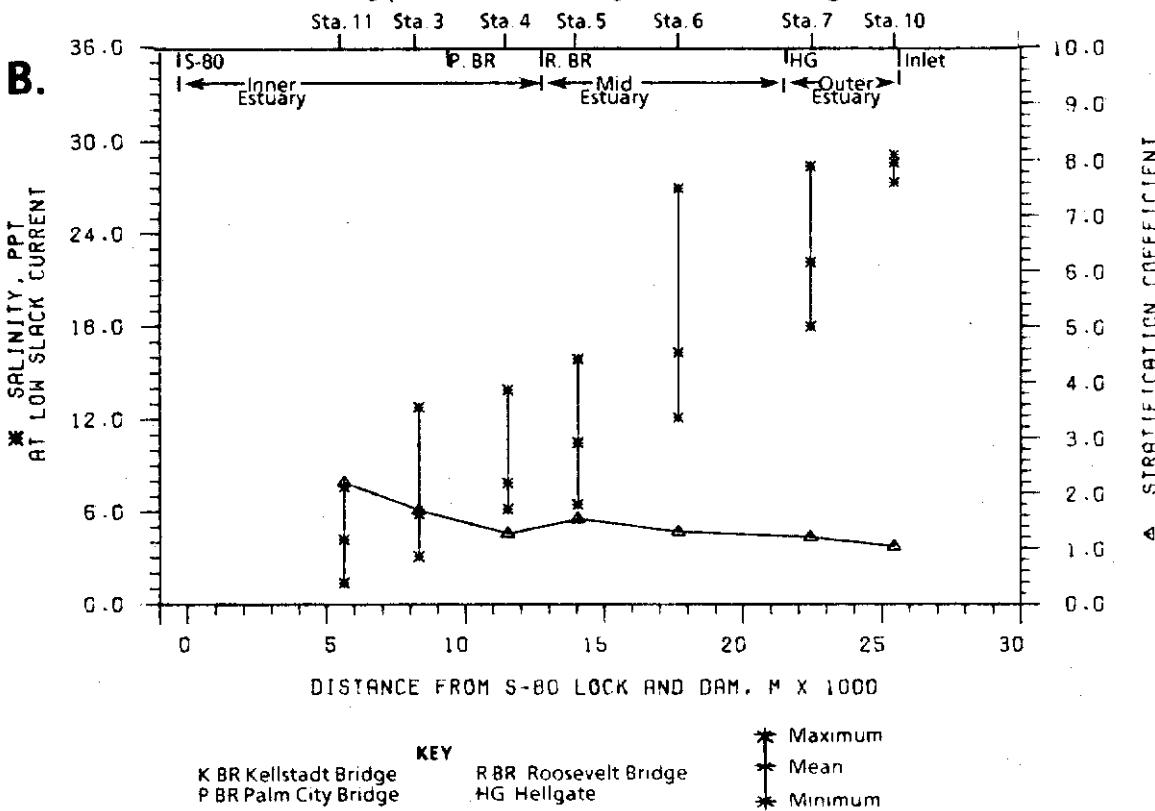
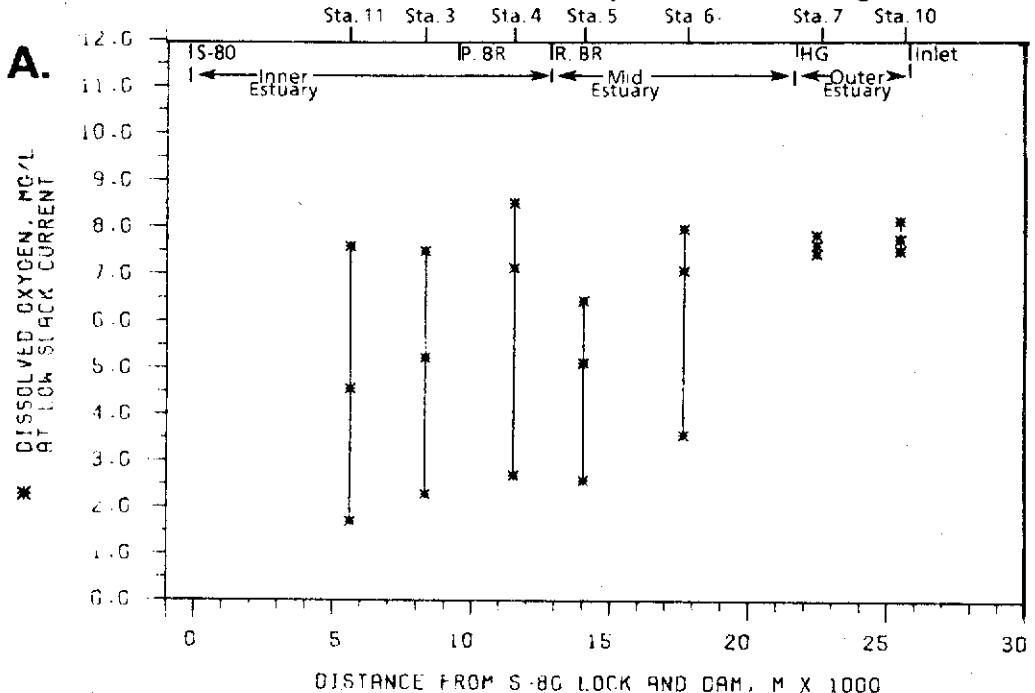


FIGURE 9. SALINITIES AND STRATIFICATION COEFFICIENTS IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

June 15, 1978--4 Days Before Discharge



June 20, 1978--1 Day of Discharge

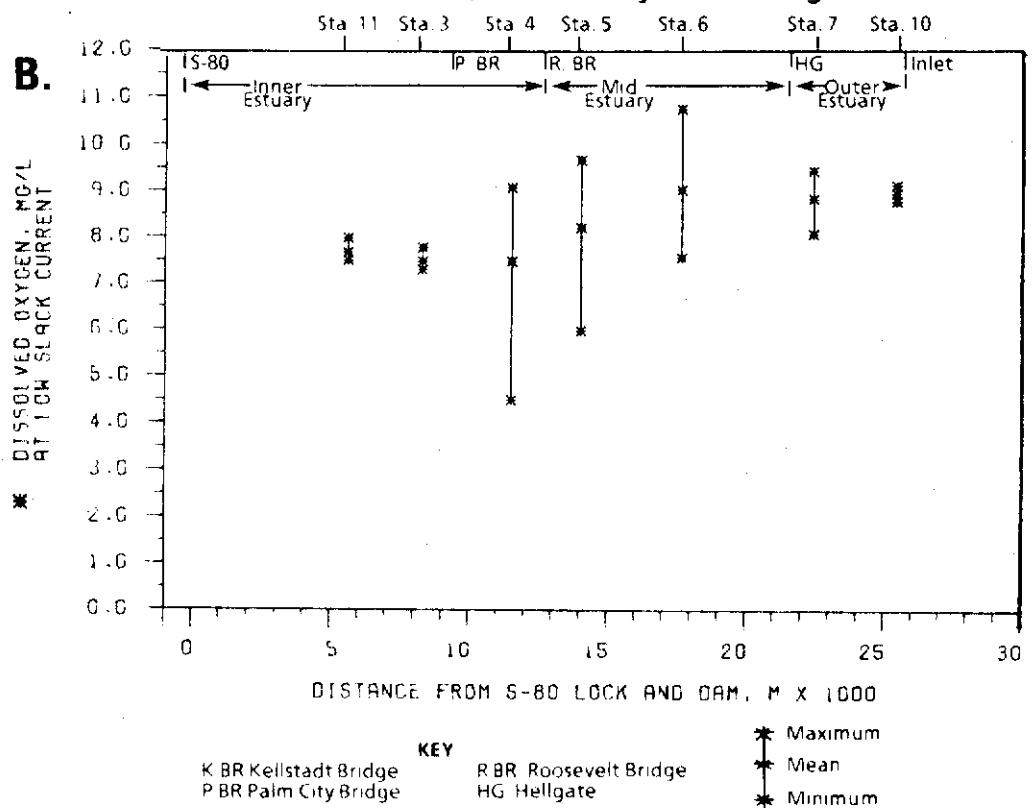
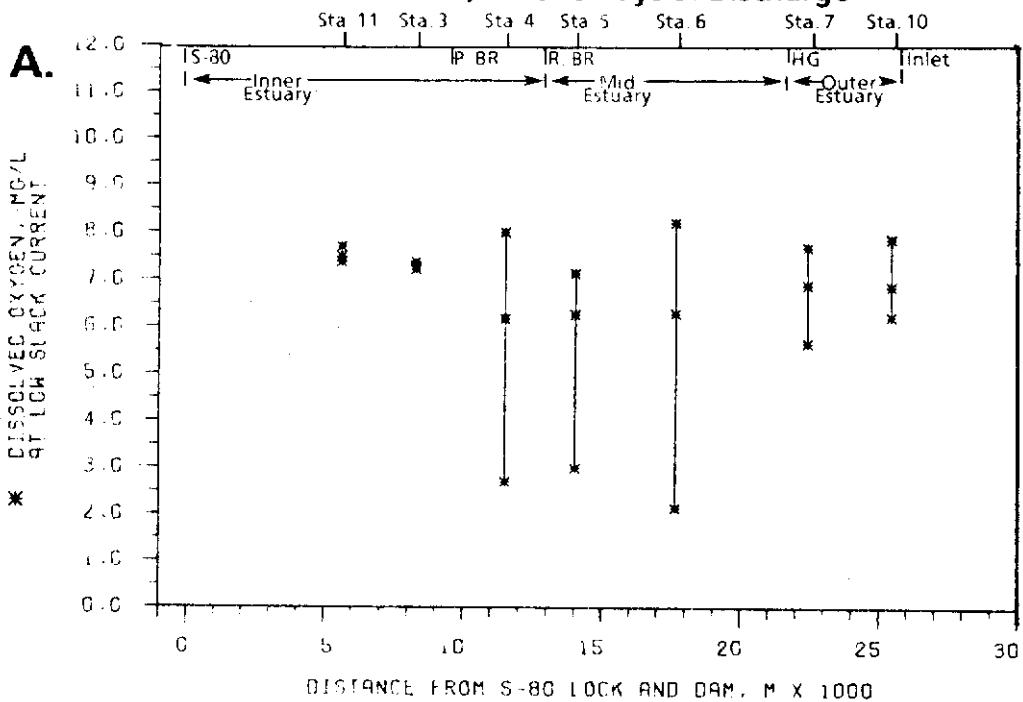


FIGURE 10. DISSOLVED OXYGEN IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

June 27, 1978--8 Days of Discharge



July 7, 1978--18 Days of Discharge

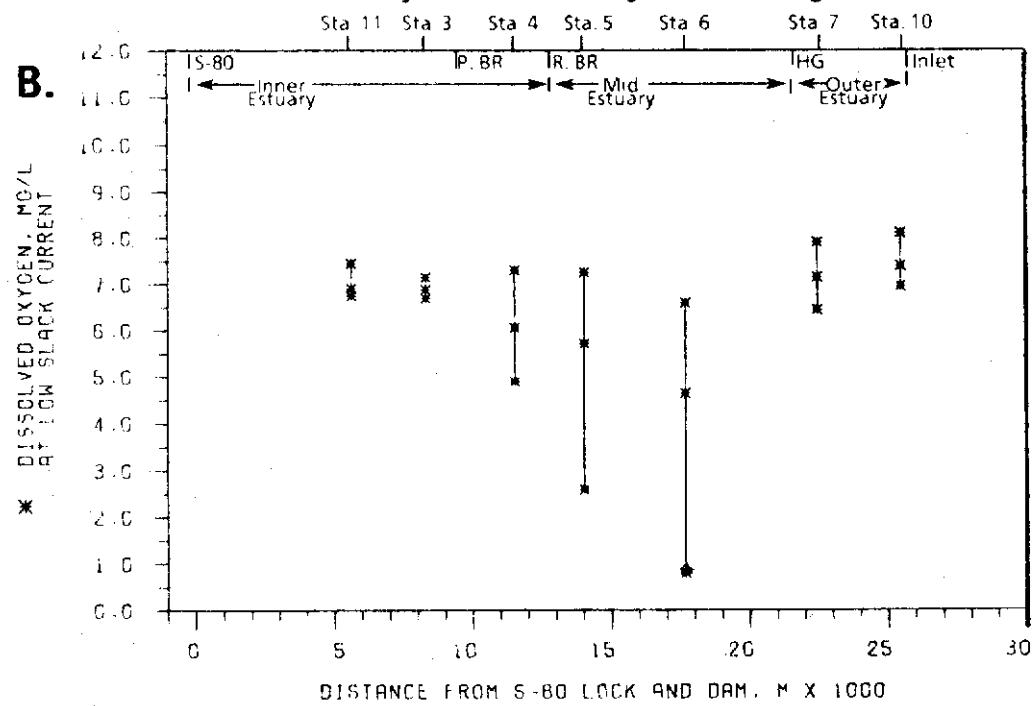


FIGURE 11. DISSOLVED OXYGEN IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

highly stratified conditions measured before the discharge began (Figure 12).

Temperature

The average water temperature ranged from 31.5°C in the inner estuary to 27.1°C at the St. Lucie Inlet prior to the discharge. After one day of discharge, the uniform temperatures from the surface to the bottom indicated the water was well mixed from S-80 to the Palm City Bridge. This well mixed water remained for the duration of the discharge. A general trend of higher temperatures in the inner estuary and an overall increase in temperature for the whole estuary occurred as the summer progressed (Appendix A).

Turbidity

Antecedent conditions that are shown in Table 4 reveal turbidity maximums where the estuary widens in the South and North Forks (stations 1 and 3). After the discharge began the most pronounced changes in turbidity occurred in the South Fork to the Roosevelt Bridge area (station 5). Accumulated fine sediments from the St. Lucie Canal (C-44), downstream to about Cabana Point (station 3), were resuspended during the first several days of discharge resulting in rapid increases in turbidity in this area (Figure 13). Further downstream at stations 4 and 5, turbidity slowly increased during the first week of discharge as suspended solids and low salinity water moved out of the system. Stations 6, 7, and 10 in the middle and outer estuary showed only a slight increase in turbidity over background levels. Turbidity measurements in the Indian River (stations 8 and 9) showed no noticeable increase or decrease throughout the study (Table 4).

Nutrients

Nutrient concentrations in the discharge water from S-80 changed rapidly during the first days of releases. Figure 14 shows that ammonia N, nitrite N, and nitrate N dramatically increased on the first day

TABLE 3. DISSOLVED OXYGEN (ppm) IN THE NORTH FORK AND OUTER ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

	Date	Mean	Min.	Max.
NORTH FORK STATION 1C				
	6/15	8.4	5.0	9.3
	6/20	6.8	5.2	8.0
	6/27	6.8	5.9	7.5
	7/7	6.0	5.0	6.4
	7/12	7.3	4.9	8.7
	7/20	9.3	7.6	9.6
NORTH FORK STATION 2C				
	6/15	6.7	0.9	8.4
	6/20	6.5	2.8	10.4
	6/27	7.9	0.7	9.8
	7/7	7.1	4.6	8.7
	7/12	6.8	5.3	7.8
	7/20	6.2	1.3	9.6
OUTER ESTUARY STATION 8C				
	6/15	7.2	7.0	7.4
	6/20	9.2	8.8	9.9
	6/27	7.8	7.4	8.4
	7/7	6.5	6.3	7.0
	7/12	6.3	6.0	6.7
	7/20	9.7	9.2	10.6
OUTER ESTUARY STATION 9C				
	6/15	7.8	7.7	7.9
	6/20	9.2	9.1	9.4
	6/27	7.2	6.6	7.6
	7/7	7.0	6.8	7.3
	7/12	7.3	6.7	8.0
	7/20	9.4	9.3	9.8

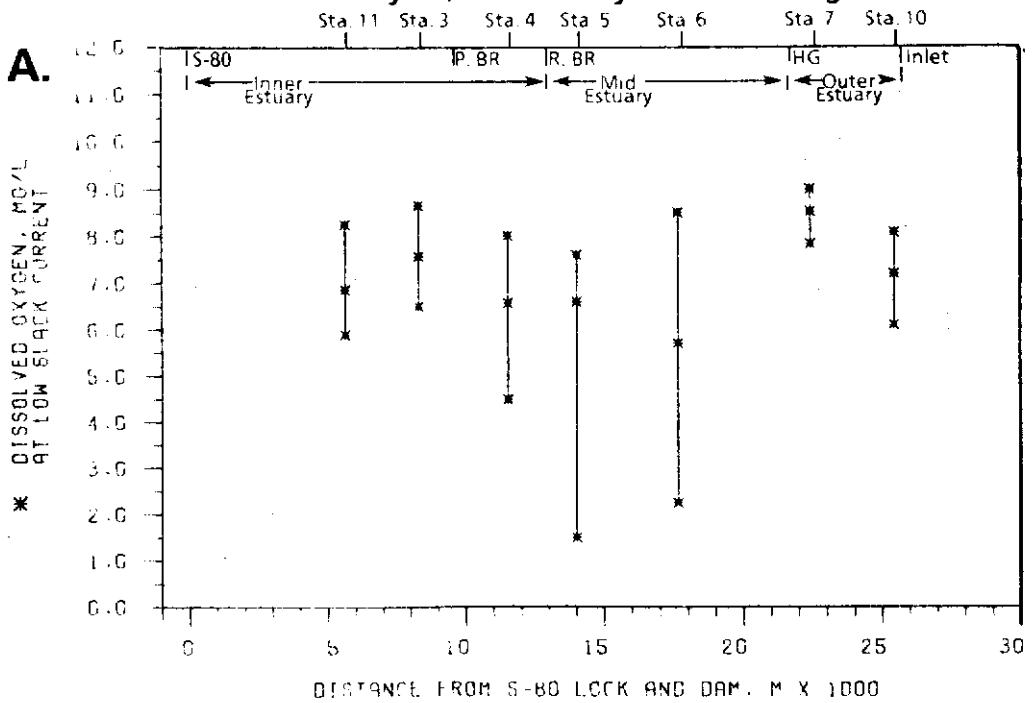
TABLE 4. TURBIDITY (JTU) THROUGHOUT THE ST. LUCIE ESTUARY DURING THE 2500 CFS STUDY

Sta.	Distance (KM) from S-80	Discharge Starts			Sample Date			Discharge Stops		
		6-16	6-19	6-22	6-27	6-30	7-6	7-10	7-11	7-14
1		7.0	ND	6.0	7.8	5.5	9.5	7.3	10.0	
2		4.8	ND	6.3	9.6	5.0	9.0	9.2	8.2	
S-80*	0.0	1.1	ND	4.8	8.5	6.2	ND	ND	2.0	
11	5.2	4.0	3.8	15.0	14.0	9.5	12.5	6.0	11.0	
3	7.8	8.4	13.6	19.3	16.7	22.5	10.0	13.0	13.0	
4	10.8	5.4	7.5	10.6	16.0	10.0	9.9	9.0	10.0	
5	12.9	5.8	6.7	8.5	12.1	9.9	11.0	7.8	6.3	
6	16.7	2.8	6.9	5.6	7.7	5.4	8.0	7.0	6.3	
7	21.9	3.9	5.3	5.9	6.6	5.0	6.9	5.7	4.4	
8		5.5	3.5	3.6	8.5	4.1	6.8	5.4	5.2	
9		3.8	9.5	5.3	5.8	5.5	7.4	4.0	4.8	
10	25.4	3.2	5.2	5.4	5.3	5.5	7.0	4.5	5.4	

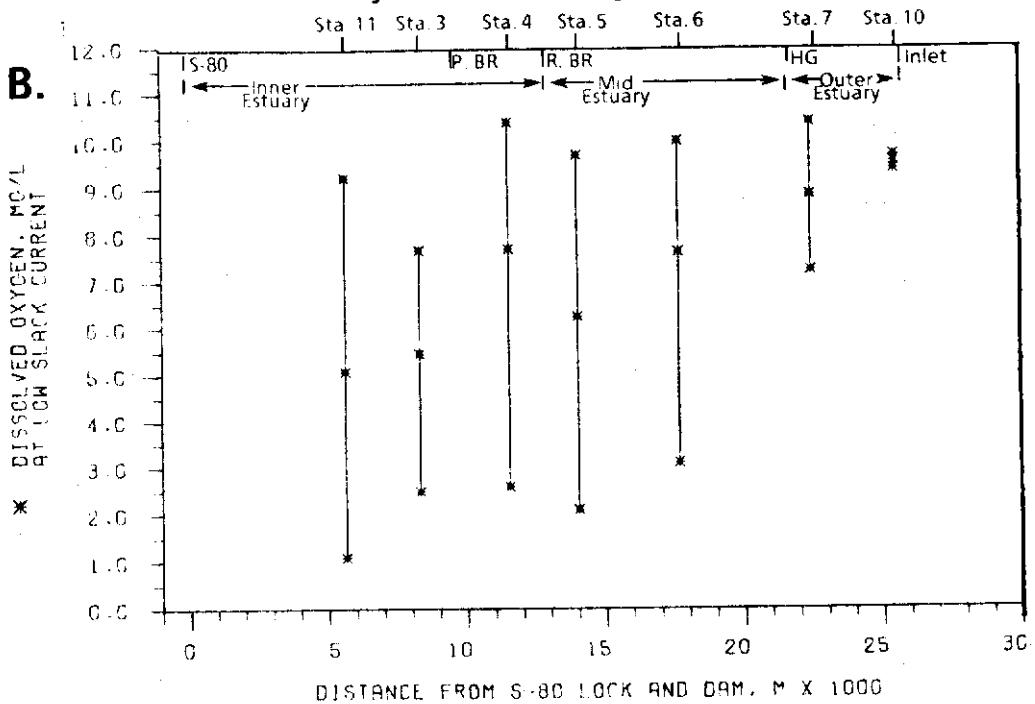
ND = No Data

*Samples taken upstream

July 12, 1978--2 Days Post Discharge



July 20, 1978--10 Days Post Discharge



KEY
 K BR Kellstadt Bridge R BR Roosevelt Bridge
 P BR Palm City Bridge HG Hellgate

* Maximum
 * Mean
 * Minimum

FIGURE 12. DISSOLVED OXYGEN IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

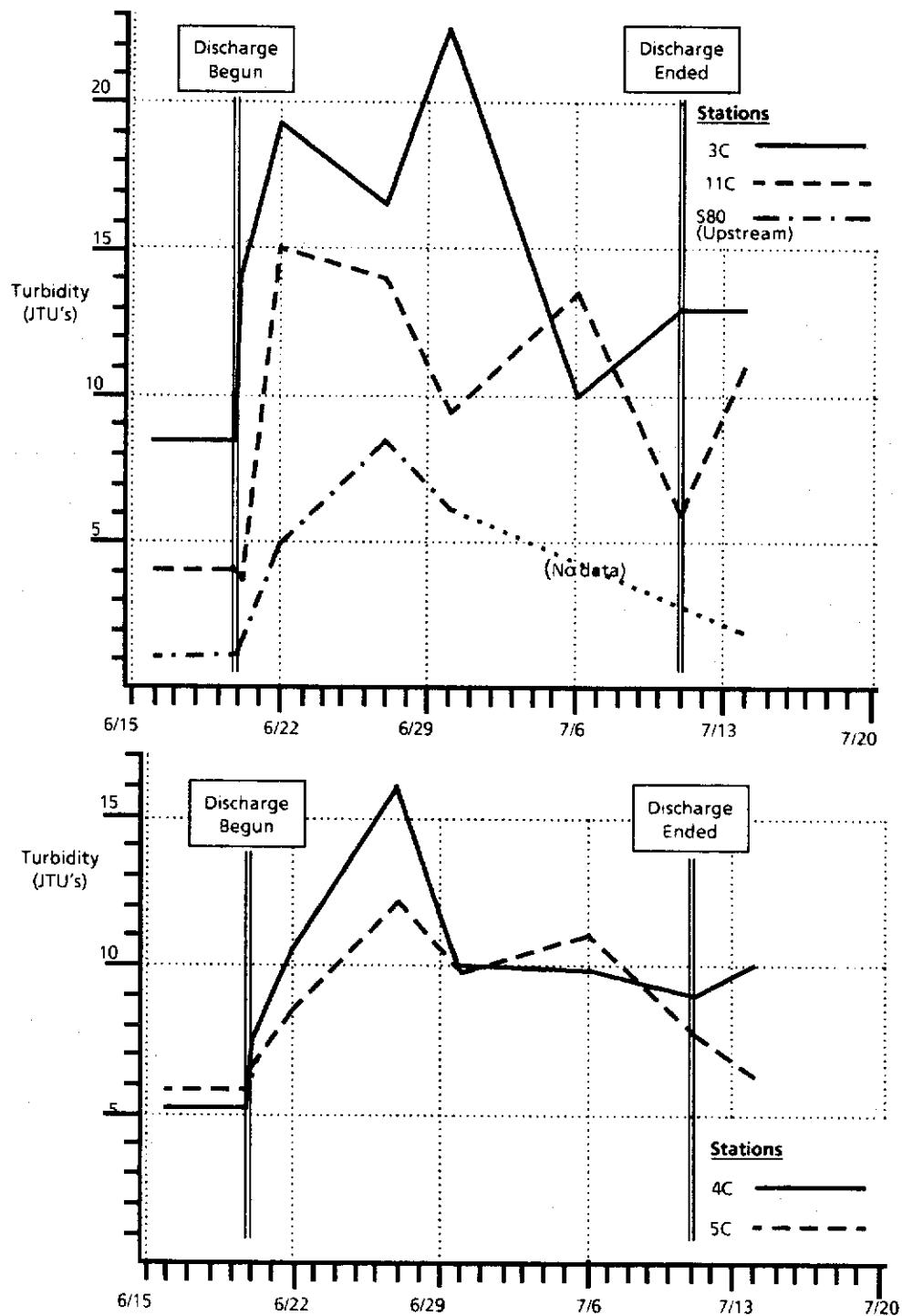


FIGURE 13. TURBIDITY IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

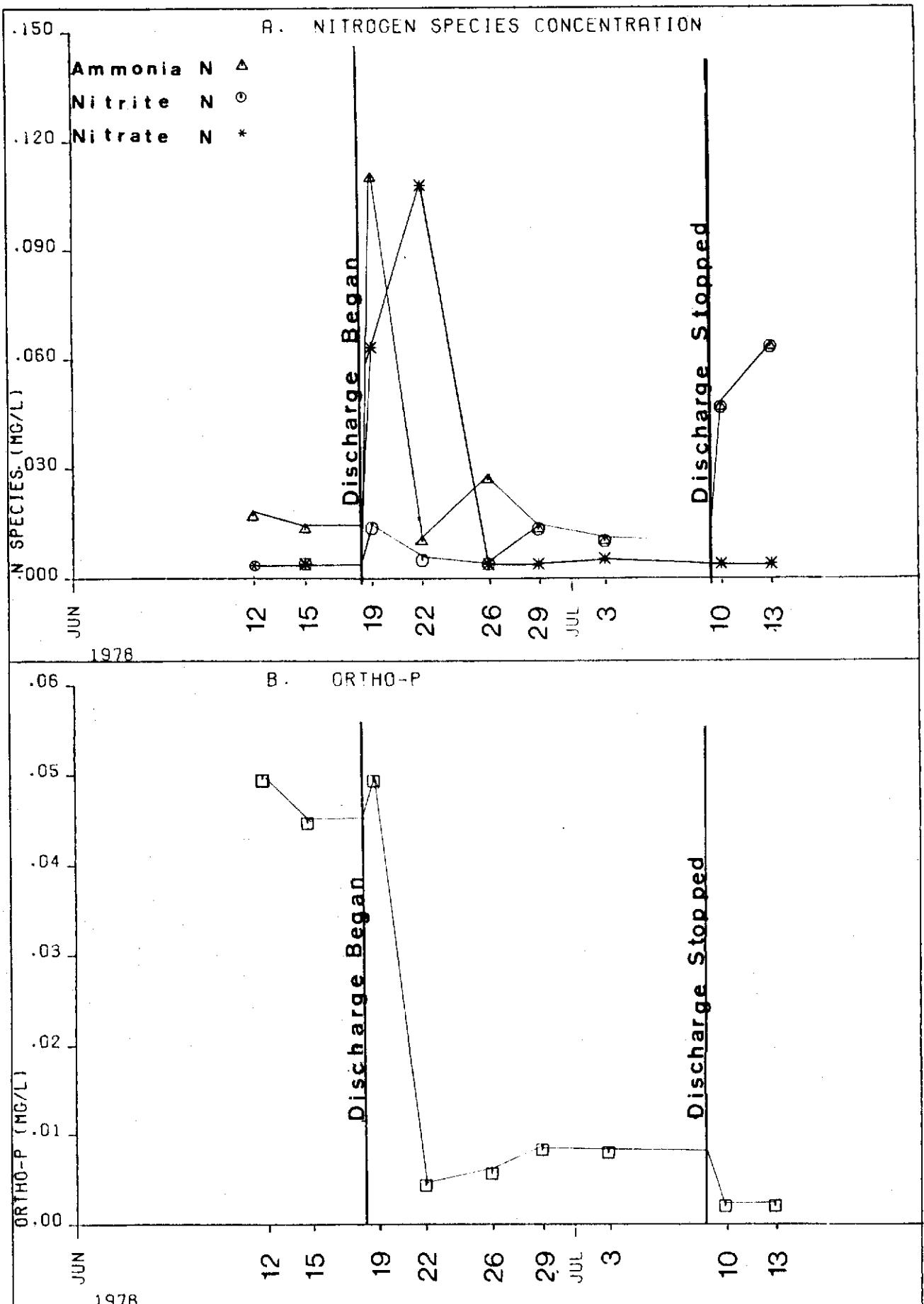


FIGURE 14. NUTRIENTS AT S-80 DURING 2500 CFS DISCHARGE STUDY

of discharge and then returned to pre-discharge levels within a week. Ortho-phosphorus levels upstream of S-80 showed a marked decrease after the third day of discharge. This correlates with the time required to exchange the volume of C-44 during a 2500 cfs release from S-308. Thereafter, ortho-phosphorus levels were similar to concentrations in Lake Okeechobee waters.

Benthic Macroinvertebrates

Substrates sampled for benthic macroinvertebrates in the St. Lucie Estuary were categorized into two groups. The inner and middle estuary (transects 1 to 6) had dark, mud substrates with a considerable amount of organic material. The bottom composition of the outer estuary (transects 7 to 10) was sand and shell (Table 5). Six classes of invertebrates, as

density (12,500 benthos/m²) consisted of the bivalve, *Mulinia lateralis*, and the amphipods, *Ampelisca abdita*, and *Cerapus* sp. (Tables 6 and 7). Although not

TABLE 6. DENSITY (#/m²)x102 AND PERCENT OF POPULATION (PP) FOR EACH CLASS OF BENTHOS IN THE INNER AND MID-ESTUARY BEFORE AND AFTER DISCHARGE

Trans- ect	Class	Before Discharge		After Discharge	
		Density	PP	Density	PP
1SCX	Bivalvia	110.1	75.9	26.6	42.2
	Crustacea	29.2	20.1	22.6	35.8
	Gastropoda	3.7	2.5	-	-
	Polychaeta	2.1	1.4	1.5	2.4
	Insecta	-	-	12.3	19.6
		145.1		63.0	
2SCX	Crustacea	75.4	59.5	22.9	45.8
	Bivalvia	45.1	35.6	0.9	1.8
	Polychaeta	6.0	4.7	1.3	2.6
	Gastropoda	0.2	0.2	-	-
	Insecta	-	-	25.0	49.9
		126.7		50.1	
3SCX	Crustacea	72.8	61.5	23.5	55.6
	Bivalvia	30.9	26.1	0.4	1.0
	Polychaeta	11.9	10.1	7.5	17.6
	Gastropoda	2.7	2.2	1.7	3.9
	Insecta	0.1	0.1	9.3	21.9
		118.4		42.4	
4SCX	Crustacea	60.6	66.5	6.0	15.3
	Bivalvia	29.2	32.1	0.1	0.4
	Polychaeta	1.3	1.4	20.7	52.5
	Gastropoda	-	-	12.6	32.0
	Insecta	-	-	-	-
		91.1		39.4	
5SCX	Bivalvia	86.6	56.1	88.5	45.3
	Crustacea	63.5	41.1	33.2	17.0
	Polychaeta	4.1	2.7	73.4	37.6
	Gastropoda	0.1	0.1	0.1	0.1
	Insecta	-	-	0.2	0.1
		154.3		195.4	
6SCX	Bivalvia	94.9	82.7	22.8	84.8
	Crustacea	15.0	13.1	0.7	2.7
	Polychaeta	.2	2.8	3.3	12.3
	Gastropoda	1.7	1.4	0.1	0.3
	Insecta	-	-	-	-
		114.8		26.9	
Mean Density =		125.1		69.5	

TABLE 5. DEPTHS AND SUBSTRATE DESCRIPTION AT EKMAN STATIONS IN ST. LUCIE ESTUARY

Station	Depth (M)	Substrate Description
<u>Inner Estuary</u>		
1S	1.7	mud, sand, shell, detritus
1C	2.0	mud, shell, detritus, sapropel
1X	1.0	mud, sand
2S	2.5	mud, shell, detritus
2C	3.0	mud, shell, sapropel
2X	2.5	mud, sapropel, silt
3S	0.7	mud, sand, shell
3C	3.5	mud, sapropel
3X	1.8	mud, silt, sapropel
4S	2.5	mud, sapropel, shell
4C	3.0	mud, shell, sapropel
4X	1.5	mud, shell, sapropel
<u>Mid-Estuary</u>		
5S	1.5	mud, shell
5C	3.5	mud, shell, sapropel
5X	2.0	mud, sapropel
6S	2.0	mud, shell
6C	3.0	mud, sapropel
6X	1.0	mud, sand
7S	1.0	sand, mud, shell
7C	3.0	sand, mud
7X	2.0	sand, shell, mud
<u>Outer Estuary</u>		
8S	2.0	sand
8C	3.0	sand, shell
8X	2.0	sand
9S	1.0	sand, mud
9C	3.5	sand, shell, mud
9X	1.5	sand, mud, silt, detritus
10S	1.5	sand, small shell, silt
10C	3.5	sand, small shell
10X	2.5	sand, shell

Sapropel = Bottom deposits rich in decomposing organic matter

represented by 69 species, were collected from these two types of substrates before and after the controlled discharge (Appendix B).

Prior to the discharge a considerable difference in species composition and density of organisms was apparent in samples from mud and sand substrates. From the mud habitats, about 80% of the average

represented in large numbers, several other species were present in at least 60% of the samples and included the polychaetes, *Paraprionospio pinnata*, *Nereis* sp., and *Glycinde solitaria* and the isopod, *Leptochelia savignyi* (Figure 15). All of these opportunistic benthic species can tolerate dramatic

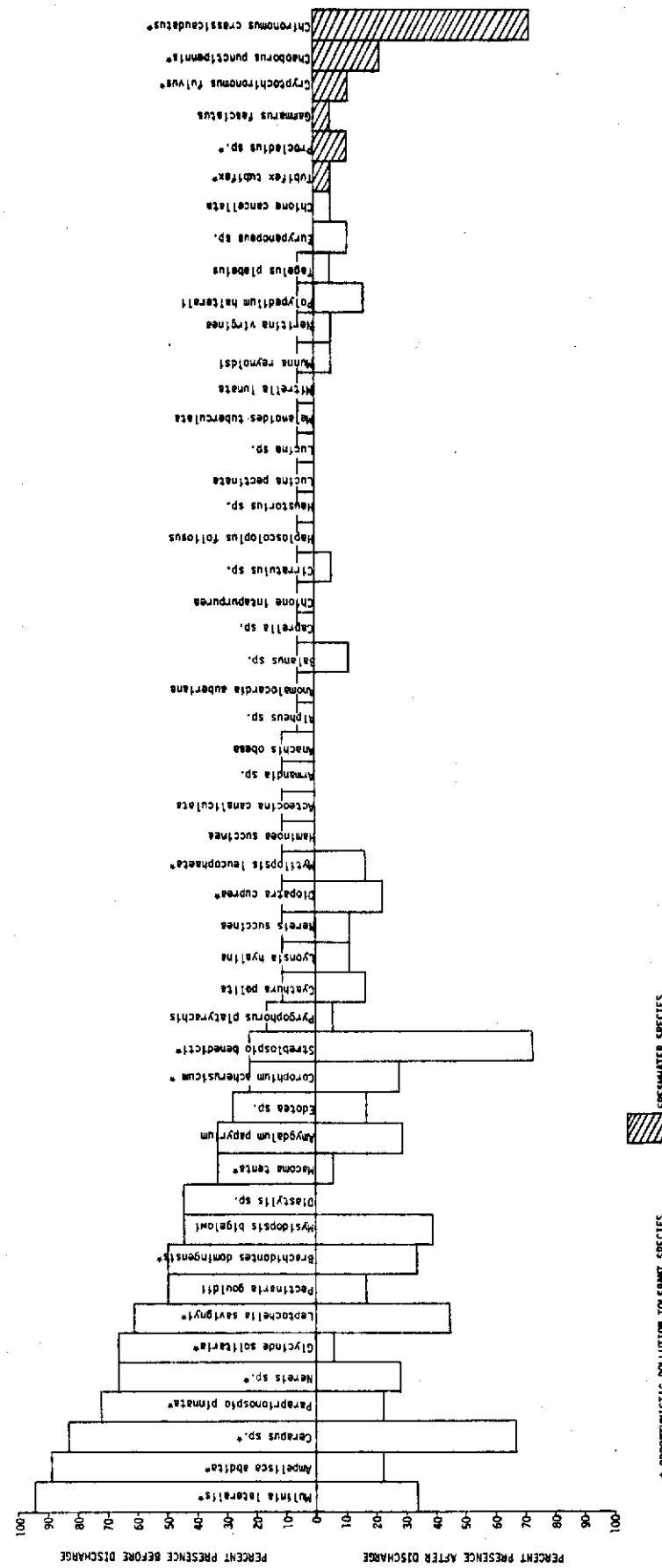


FIGURE 15. PERCENT PRESENCE OF BENTHIC SPECIES BEFORE AND AFTER THE 2500 CFS DISCHARGE.
INNER AND MIDDLE ESTUARY STATIONS 1SCX THROUGH 6SCX, SAMPLED ON 6-13-78 AND 7-10-78

changes in the environment and take advantage of a wide variety of habitats.

The average density of organisms in the sand substrate of the outer estuary was appreciably lower (1,120 benthos/m²) than in the mud substrate (Table 8). Approximately 37% of the number of organisms captured were represented by *M. lateralis*. The amphipod, *Haustorius* sp., and the polychaete, *G. solitaria*, each accounted for about 10% of the number of benthos collected (Table 7). Several other species were less

Cyathura polita, and the gastropod *Pyrgophorus platyrachis* exhibited a distinct preference for the inner and middle estuary habitat. The high salinity, sand substrate in the outer estuary provided the only environment for the amphipods, *Bathyporeia* sp., and *Haustorius* sp., and the bivalve, *Chione grus*. Several species, however, were found at higher densities in the mud substrates but were present throughout the estuary. These ubiquitous species included *M. lateralis*, *A. abdita*, *Cerapus* sp., and *G. solitaria*.

After the discharge the similarity index indicated that the benthic invertebrate species composition changed 23% for the entire estuary. This change is attributed to (a) the loss and recruitment of many rare marine and estuarine species which represented less than 1% of the total relative abundance, and (b) to the introduction of seven freshwater species of which six were aquatic insect larvae (Figures 15 and 16). Six of the freshwater invertebrates were present after the discharge in the inner estuary and just downstream of the Roosevelt Bridge (transects 1 to 5). At these same transects the polychaete *G. solitaria* and the cumacean shrimp *Diastylis* sp. were absent after the discharge. The overall species composition change probably occurred during the transition from mesohaline (salinities 5 to 18 ppt) to oligohaline (0.5 to 5 ppt) conditions in the inner estuary. One of the fresh water insect larvae, the mayfly nymph (*Callibaetis floridanus*), was present in the outer estuary at transects 7 and 8 after the discharge where salinities were above 15 ppt.

The highest densities of benthic invertebrates were present in the inner and middle estuary (transects 1 to 6) both before and after the discharge event. However, an overall reduction in densities of 44% occurred in this area and only a slight decrease in densities (1%) occurred in the outer estuary. The reduction in densities at transects 1 to 6 appeared in almost every class of benthic invertebrate. Exceptions included the dramatic increase in density of insects throughout the inner estuary and the increase in polychaetes at transects 4 and 5 (Tables 6 and 8). The introduction of the freshwater midge larvae, (*Chironomus crassicaudatus*) was mainly responsible for the increase in insects. Increased densities of polychaetes resulted primarily from the increase in populations of *Sreblospio benedicti*.

The total relative abundance (TRA) of the major species inhabiting the outer estuary did not change substantially after the discharge (Table 7). However, four species in the inner and mid-estuary (*Cerapus* sp., *Sreblospio benedicti*, *Brachidontes domingensis*, and *Chironomus crassicaudatus*) showed substantial increases in TRA while *Mulinia lateralis* and *Ampelisca abdita* declined dramatically.

An overall decrease in the species diversity of benthic invertebrates occurred in the inner and mid-estuary. The introduction of numerous freshwater midge larvae and severe reductions of the predominant species, *M. lateralis* and *A. abdita*, in the inner estuary contributed to the overall decrease in species diversity index from 1.7 to 1.4. Contrary to this, the species diversity index in the outer estuary remained 2.2 although the salinity at transects 8 and 9 decreased from about 30 ppt to 20 and 26 ppt respectively, at low tide.

In summary, during the 2500 cfs discharge study there were no significant changes in the macro-invertebrate communities in the outer estuary. Changes in benthos did occur in the inner and middle estuary:

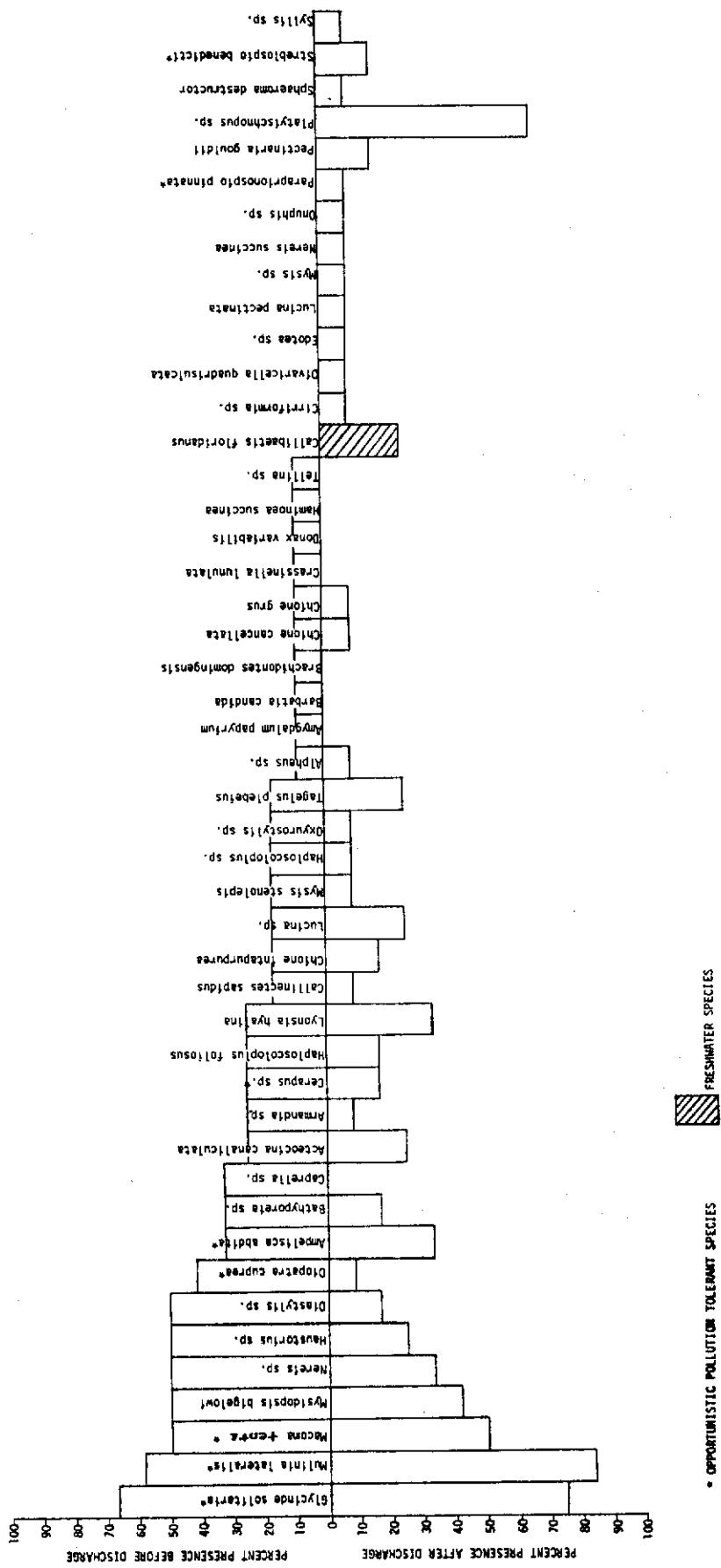
TABLE 7. TOTAL RELATIVE ABUNDANCE (TRA %) OF THE BENTHIC SPECIES CULLED AT 1% BEFORE AND AFTER DISCHARGE

Inner and Mid-estuary			
TAXA	Transects 1-6		TRA % 7-10-78
	TRA % 6-13-78	TRA % 7-10-78	
<i>Mulinia lateralis</i>	44.4	6.4	
<i>Ampelisca abdita</i>	25.7	0.8	
<i>Cerapus</i> sp.	9.0	16.5	
<i>Brachidontes domingensis</i>	6.8	25.8	
<i>Leptochelia savignyi</i>	6.3	5.1	
<i>Sreblospio benedicti</i>	1.6	24.5	
<i>Corophium acherusicum</i>	0.4	1.1	
<i>Chironomus crassicaudatus</i>	0.01	13.9	
Outer Estuary			
TAXA	Transects 7-10		TRA % 6-13-78
	TRA % 6-13-78	TRA % 7-10-78	
<i>Mulinia lateralis</i>	37.4	51.7	
<i>Haustorius</i> sp.	9.6	5.4	
<i>Glycinde solitaria</i>	9.5	8.1	
<i>Diastylis</i> sp.	6.3	0.4	
<i>Macoma tenta</i>	5.6	2.1	
<i>Ampelisca abdita</i>	3.1	2.6	
<i>Bathyporeia</i> sp	2.7	0.5	
<i>Mysidopsis bigelowi</i>	2.4	1.6	
<i>Diopatra cuprea</i>	2.3	0.4	
<i>Chione cacellata</i>	2.1	0.2	
<i>Chione grus</i>	1.9	1.9	
<i>Nereis</i> sp.	1.9	0.7	
<i>Tellina</i> sp.	1.6	0.0	
<i>Mysis stenolepis</i>	1.6	0.2	
<i>Cerapus</i> sp.	1.1	0.5	
<i>Lyonsia hyalina</i>	1.1	1.1	
<i>Chione intapurpurea</i>	1.1	0.4	
<i>Acteocina canaliculata</i>	0.5	2.3	
<i>Haploscoloplos</i> sp.	0.3	1.1	
<i>Armandia</i> sp.	0.8	1.4	
<i>Platyischnopeus</i> sp.	0.0	6.3	
<i>Sphaeroma destructor</i>	0.0	1.2	
<i>Donax variabilis</i>	0.0	3.9	

abundant, but were regularly present in at least 50% of the samples (Figure 16). With the inclusion of the bivalve, *Macoma tenta*; the two shrimp, *Mysidopsis bigelowi* and *Diastylis* sp., and the polychaete, *Nereis* sp., these seven species accounted for more than 72% of the benthos captured before the discharge began. The remaining 26 species collected in the outer estuary were not as frequently represented.

The distribution of benthic species before the discharge was influenced by the type of substrate and level of salinity. The isopods, *L. savignyi* and

FIGURE 16. PERCENT PRESENCE OF BENTHIC SPECIES BEFORE AND AFTER THE 2500 CFS DISCHARGE.
 OUTER ESTUARY STATIONS 7SCX THROUGH 10SCX, SAMPLED ON 6-13-78 AND 7-10-78



1. Six freshwater species were introduced and at least four estuarine species were reduced in numbers within the newly created oligohaline zone.
2. A population explosion of the freshwater midge larvae, *Chironomus crassicaudatus*, and an increased density of the polychaete, *Streblospio benedicti* occurred.
3. The overall density of benthos decreased by 44%.

TABLE 8. DENSITY (#/m²)x10² AND PERCENT OF POPULATION (PP) FOR EACH CLASS OF BENTHOS IN THE OUTER ESTUARY BEFORE AND AFTER DISCHARGE

Trans-	Class	Before Discharge		After Discharge	
		Density	PP	Density	PP
7SCX	Bivalvia	9.8	55.7	4.8	43.5
	Crustacea	3.9	22.5	2.9	26.6
	Polychaeta	3.4	19.7	2.4	22.1
	Gastropoda	0.4	2.1	0.7	6.5
	Insecta	-	-	0.1	1.3
		17.5		10.9	
8SCX	Crustacea	4.4	50.8	1.5	35.6
	Bivalvia	2.8	32.5	1.3	30.5
	Polychaeta	1.3	15.0	1.4	32.2
	Gastropoda	0.1	1.7	-	-
	Insecta	-	-	0.1	1.7
		8.6		4.3	
9SCX	Bivalvia	10.7	66.5	17.2	81.1
	Crustacea	3.6	22.3	2.3	10.8
	Polychaeta	1.5	9.4	1.7	8.1
	Gastropoda	0.2	1.3	-	-
	Insecta	-	-	-	-
		16.-		21.2	
10SCX	Bivalvia	1.0	40.0	2.5	56.4
	Crustacea	0.8	31.4	1.4	30.7
	Polychaeta	0.7	29.6	0.4	8.1
	Gastropoda	-	-	0.2	4.8
	Insecta	-	-	-	-
		2.5		4.5	
Mean Density =		11.2		10.2	

Fish

The trawl and beach seines employed in this study were designed to collect small fish and therefore samples do not adequately represent the larger size classes of important sport and commercial fish. Only five species of fish captured during the study were consistently greater than 100 mm (Appendix C). These species included *Arius felis* (sea catfish), *Bagre marinus* (gafftopsail catfish), *Centropomus undecimalis* (snook), *C. pectinatus* (tarpon snook, known locally as cuban snook), and *Archosargus probatocephalus* (sheepshead).

During this study, a total of 42,178 fish, representing 84 species, were captured. Most of this catch (96%) consisted of 10 species. *Anchoa mitchilli* (bay anchovy), *Menidia beryllina* (tidewater

silverside), *Eucinostomus* sp. (mojarras) and Clupeid juveniles (herrings) comprised 92% of the catch (Table 9).

Species presence data were pooled (Table 10) for the South Fork (stations 11, 3, 4), North Fork (stations 1, 2), middle estuary (stations 5, 6), and outer estuary (stations 7, 8, 9, 10). These data showed the following general trends:

1. Within the four estuarine areas, those fish that were dominant prior to the discharge remained throughout the entire 2500 cfs monitoring effort.
2. Throughout the study, shallow grassbed communities located in the outer estuary had the greatest diversity of fish.

In Table 11, individual species response to the 2500 cfs discharge was divided into five categories. Four freshwater species were introduced from upstream during the discharge: *Dorosoma cepedianum* (gizzard shad), *Gambusia affinis* (mosquito fish), *Ictalurus catus* (white catfish), and *Pomoxis nigromaculatus* (black crappie). These freshwater species were primarily caught in the South Fork, but *I. catus* was present on the last sample date (12 July) in the North Fork and at Hoggs Cove (station 6T) where the salinity was 4.0 ppt.

Fish that entered the South Fork during the discharge included the larval stages (leptocephalus) of the three primitive marine fishes: *Albula vulpes* (bonefish), *Elops saurus* (ladyfish), and *Megalops atlantica* (tarpon). In addition, *Centropomus undecimalis* (snook) also entered the inner estuary.

Three species left the inner and middle estuary. These species were *Anchoa hepsetus* (striped anchovy), *Lagodon rhomboides* (pinfish), and *Orthopristis chrysoptera* (pigfish).

The last 34 species listed in Table 11 (categories IV and V) either remained within the inner estuary or were present throughout the system during the monitoring efforts.

The reactions of fish communities to the changes in salinity were evaluated with a cluster analysis using pooled presence-absence data in Table 10 for seine and trawl samples. The phenogram (Figure 17) represents a clustering of the four major estuarine trawl sampling areas for five sample dates based on the biotic similarity of the fish communities sampled. The clustering of data suggest that species composition remained similar within the sampling areas throughout the five-week study in spite of dramatic changes in salinity. The middle estuary was unique in this cluster primarily due to the presence of *Anchoa lyolepis*, *Lagodon rhomboides*, *Synodus foetus*, *Chloroscombus chrysura*, and *Menticirrhus americanus* which were seldom collected in the other areas. Table 10 indicates that *Centropomus pectinatus* was captured only in the North Fork (station 1T) while *Bagre marinus* was unique to the South Fork where *Cynoscion* spp. and *Citharichthys spilopterus* were most often found. Furthermore, the addition of freshwater species to the South Fork after the discharge began accounted for most of the differences in species composition between these two areas.

The similarity in species composition of seine samples during the study was less than for the trawl samples (Figure 18). Before the discharge began the species composition in the North Fork and South Fork were similar (S1 and N1). However, after the discharge began, freshwater species and three species of leptocephalus were added to the South Fork so that the North and South Fork communities became

TABLE 9. FISH CAUGHT DURING THE 2500 CFS DISCHARGE STUDY IN DECREASING ORDER OF NUMERICAL ABUNDANCE, SCIENTIFIC, AND COMMON NAME

TAXON	COMMON NAME	NUMBER CAUGHT	% OF CATCH
1	Anchoa mitchilli	25292	60.0
2	Menidia beryllina	4699	11.1
3	Clupeidae, juveniles*	4496	10.7
4	Eucinostomus, juveniles*	2395	5.7
5	Eucinostomus gula	1031	2.4
6	Eucinostomus argenteus	981	2.3
7	Dorosoma pentenense	570	1.4
8	Dapterus olithostomus	295	0.7
9	Arius felis	276	0.7
10	Micropogon undulatus	222	0.5
11	Bairdiella chrysura	218	0.5
12	Anchoa lyolepis	162	0.5
13	Anchoa hepsetus	147	
14	Harengula pensacolae	127	
15	Lagodon rhomboides	120	
16	Syngnathus scovelli	120	
17	Orthopristis chrysoptera	108	
18	Dapterus plumeri	64	
19	Syngnathus louisianae	61	
20	Lutjanus griseus	54	
21	Cynoscion nothus	48	
22	Diplodus holbrooki	44	
23	Trachinotus falcatus	40	
24	Sphyraena barracuda	39	
25	Haemulon parrai	37	
26	Ictalurus catus	33	
27	Archosargus probatocephalus	32	
28	Oligoplites saurus	32	
29	Cynoscion regalis	28	
30	Centropomus undecimalis	26	
31	Bagre marinus	24	
32	Citharichthys spilopterus	23	
33	Bathygobius saporator	24	
34	Brevoortia smithi	21	
35	Caranx hippos	20	
36	Lutjanus synagris	20	
37	Cynoscion nebulosus	19	
38	Strongylura marina	16	
39	Sphoeroides testudineus	15	
40	Trinectes maculatus	15	
41	Sparasoma sp.	15	
42	Achirus lineatus	15	
43	Microgobius gulosus	11	
44	Gobiosoma boscii	10	
45	Centropomus pectinatus	10	
46	Gobionellus boleosoma	8	
47	Monacanthus hispidus	8	
48	Pomoxis nigromaculatus	7	
49	Mugil curema	7	
50	Lactophrys triqueter	7	
51	Synodus foetens	7	
52	Dasyatis sabina	6	
53	Megalops atlantica, leptocephalus	6	
54	Dorosoma cepedianum	6	
55	Mugil cephalus	6	
56	Fundulus grandis	5	
57	Chiloglanis schoepfii	5	
58	Chloroscombrus chrysurus	5	
59	Elops saurus, leptocephalus	4	
60	Albula vulpes, leptocephalus	3	

TABLE 9 (con't). FISH CAUGHT DURING THE 2500 CFS DISCHARGE STUDY IN DECREASING ORDER OF NUMERICAL ABUNDANCE, SCIENTIFIC, AND COMMON NAME

61	<i>Chaetodipterus faber</i>	Spadefish	3
62	<i>Histrio histrio</i>	Sargassumfish	3
63	<i>Gambusia affinis</i>	Mosquito fish	3
64	<i>Opisthonema oglinum</i>	Atlantic thread herring	3
65	<i>Leiostomus xanthurus</i>	Spot	2
66	<i>Lucania parva</i>	Rainwater killfish	2
67	<i>Sphoeroides nephelus</i>	Southern puffer	2
68	<i>Scianenops ocellata</i>	Red drum	2
70	<i>Caranx latus</i>	Horse-eye jack	2
71	<i>Lutjanus mahogoni</i>	Mahogany snapper	2
69	<i>Labrisomus nuchipinnis</i>	Hairy blenny	2
72	<i>Chilomycterus antillarum</i>	Web burrfish	1
73	<i>Menticirrhus americanus</i>	Southern kingfish	1
74	Serranidae	Seabass	1
75	<i>Selen vomer</i>	Lookdown	1
76	<i>Strongylura</i> sp.	Needlefish	1
77	<i>Syngnathus</i> sp.	Pipefish	1
78	<i>Scorpaena grandicornis</i>	Plumed scorpionfish	1
79	<i>Etropus crossotus</i>	Fringed flounder	1
80	<i>Monacanthus</i> sp.	Filefish	1
81	<i>Gobionellus smaragdus</i>	Emerald goby	1
82	<i>Pogonias cromis</i>	Black drum	1
83	<i>Pseudupeneus maculatus</i>	Spotted goatfish	1
84	<i>Dactyloscopus crossotus</i>	Bigeye stargazer	1
85	Gobiidae	Goby	1
		Total	42,178

*Less than 30 mm, difficult to identify to species

TABLE 10. FISH PRESENCE THROUGHOUT THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

Species* Number	SOUTH FORK					NORTH FORK					MIDDLE ESTUARY					OUTER ESTUARY					Species Number		
	1	2	3	4	5+	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5			
1	B	B	B	B	B	T	B	B	T	B	B	T	B	B	B	S	S	B	B	B	1		
2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	2		
3	S	S	S												S	S	S	S	S	S	3		
4	B	B	B	B	T	B	B	T	B	B	B	B	T	S	B	B	S	B	B	S	4		
5	S	B	B	S	B	S	B	B	B	S	B	B	B	B	B	B	B	B	B	B	5		
6	B	B	B	S	S	B	B	B	B	B	B	B	B	B	S	B	B	B	B	B	6		
7	T	B	B	B	B	S	T	T	T	T	T	T	T	T	T	T	T	T	T	T	7		
8	B	B	S	B	T	B	B	B	B	T	T	T	S	T	T	T	S	S	S	S	8		
9	T	T	T	T	T	T	T	T	T	T	T	T	T	B	T	T	T	T	T	T	9		
10	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	10		
11	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	S	S	S	S	S	11		
12						T					T	T	B	T	T	S	S	S	S	S	S	12	
13	B	S				S					S	S	S	T	T	S	S	S	S	S	S	13	
14		S									S	S	S	T	T	S	S	S	S	S	S	14	
15	S												T	T	S	S	S	S	S	S	S	15	
16						S	S	S			S	S	S	S	S	S	S	S	S	S	S	16	
17						T					S	S	S	S	S	S	S	S	S	S	S	17	
18		T	T	B	T	T	T	T	B	T				S	S	S	S	S	S	S	S	18	
19														S	S	S	S	S	S	S	S	19	
20	B	T	T	S		B	T	T					S	S	S	S	S	S	S	S	S	20	
21	T	T	T	T	T	T				T	T											21	
22																							
23						S	S				S	S	S	S	S	S	S	S	S	S	S	22	
24	S			S	S		T			S	S	S	S	S	S	S	S	S	S	S	S	23	
25										S	S	S	S	S	S	S	S	S	S	S	S	24	
26		T	B	T					T				S				S	S	S	S	S	25	
27	T	T	T	T		T	T	T	T	T				T		S	T	T				26	
28	S	S	T	S	S	S	S	S	S	S			S	S	S	S	S	S	S	S	S	27	
29	T	T	T	T	T	T					T				S	S	S	T	T			28	
																						29	

**TABLE 10. (Continued) FISH PRESENCE THROUGHOUT THE ST. LUCIE ESTUARY
DURING THE 2500 CFS DISCHARGE STUDY**

Species* Number	SOUTH FORK					NORTH FORK					MIDDLE ESTUARY					OUTER ESTUARY					Species Number	
	1	2	3	4	5+	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		
30	B	S	B	B		T	T	T	T		T	T	T	T							30	
31	T	T	T	T																	31	
32	T	T	T	T		T					T	T	B			S	S	S	S	S	32	
33													S	S							33	
34	B	B	T								B	T									34	
35	S	S	S			B	B	T			B	S	T			S	S	S	S	S	35	
36																					36	
37	B	T									S	S	S			S	S	S	S	S	37	
38	S	S	S			T	S				S	S	S			S	S	S	S	S	38	
39	S					T					S	S	S			S	S	S	S	S	39	
40	T	T	T	T		T	T	T								S	S	S	S	S	40	
41																S	S	S	S	S	41	
42			T			T	T	S			B										42	
43	S	T	S	S	S	S					S										43	
44			S	S	S																44	
45						T	T	T													45	
46			S													S	S	S	S	S	46	
47											S					S	S	S	S	S	47	
48	T	T	T			S					S	S									48	
49																					49	
50																	S	S	S	S	50	
51											T	T	T			S	S	S	S	S	51	
52						T					T	T	T								52	
53	T	3									S										53	
54	S																				54	
55																					55	
56																					56	
57							T									S	S	S	S	S	57	
58								T				T	T								58	
59	S	S	S																		59	
60	S	S	S																		60	
61																S	S	S	S	S	61	
62																S					62	
63			S	S																	63	
64			S																		64	
65	T			T																	65	
66																S					66	
67																	S	S	S	S	S	67
68			S	S												S	S	S	S	S	68	
69																S	S	S	S	S	69	
70																T					70	
71																S	S	S	S	S	71	
72																S					72	
73											T										73	
74																S					74	
75																T					75	
76																S					76	
77																S					77	
78																S					78	
79																T					79	
80																S					80	
81																S					81	
82						T										S					82	
83																B					83	
84																	S					84
85																	S					85

#SP.Seine 11 13 18 2015 13 13 7 6 7 15 13 15 15 11 26 34 31 32 30
#Sp.Trawl 16 23 19 1415 11 14 19 17 13 12 14 14 17 7 5 8 4 5 4
Total#Sp. 22 27 29 2827 20 22 21 19 17 23 23 24 26 16 27 37 33 33 31

*Refer to Table 9. S = Seine, T = Trawl, B = Both Seine and Trawl

+ Sample Dates 1 = 6/14, 2 = 6/20, 3 = 6/28, 4 = 7/5, 5 = 7/12

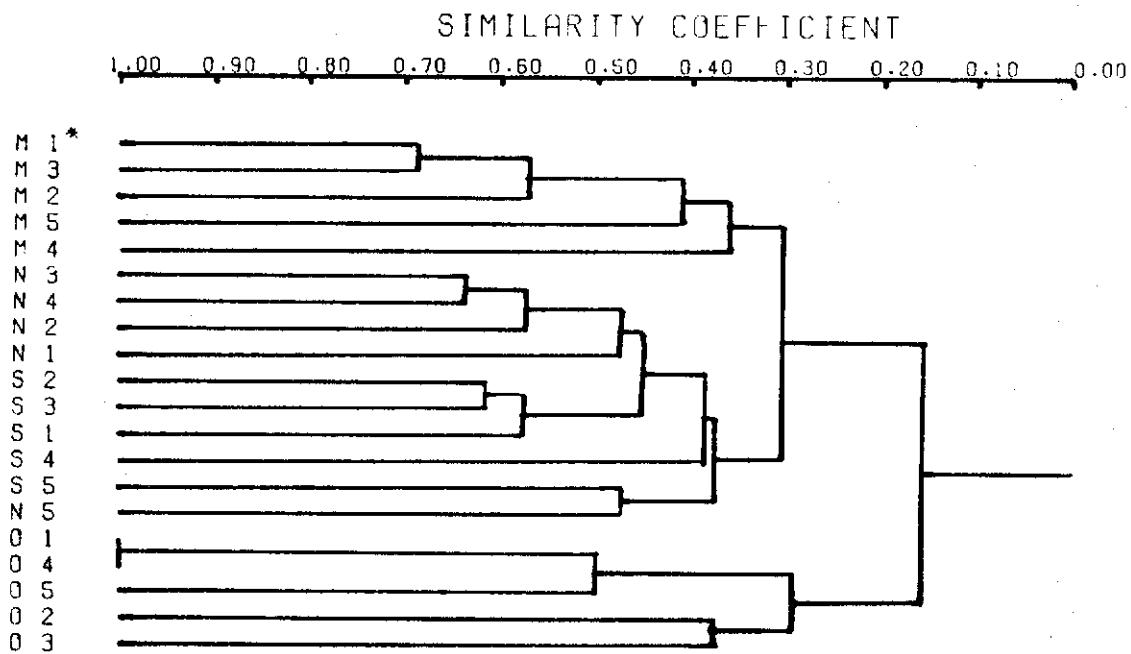


FIGURE 17. PHENOGRAM SHOWING THE SIMILARITY OF TRAWL SAMPLES COLLECTED DURING THE 2500 CFS DISCHARGE STUDY

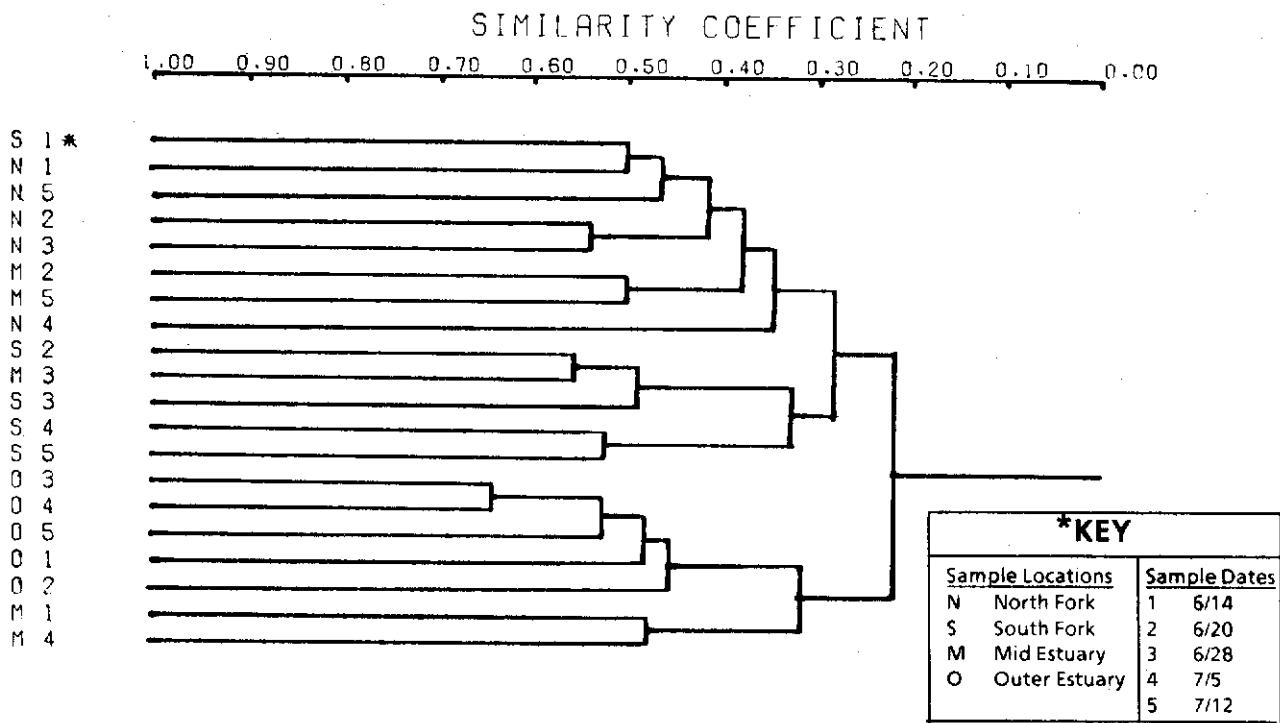


FIGURE 18. PHENOGRAM SHOWING THE SIMILARITY OF SEINE SAMPLES COLLECTED DURING THE 2500 CFS DISCHARGE STUDY

TABLE 11. FISH RESPONSE TO THE 2500 CFS FRESH WATER DISCHARGE

		Salinity*	G
		Range (ppt)	
1.	<u>Introduced from Upstream</u>		
	<i>Dorosoma cepedianum</i>	0.2-2.2	<0.5%
	<i>Gambusia affinis</i>	2.5-4.2	
	<i>Ictalurus catus</i>	0.2-4.0	<0.5%
	<i>Pomoxis nigromaculatus</i>	0.2-2.0	
2.	<u>Came into Inner Estuary</u>		
	<i>Albulia vulpes, leptcephalus</i>	2.2	
	<i>Centropomus undecimalis</i>	0.2-8.2	<0.5%
	<i>Elops saurus, leptcephalus</i>	0.2-1.5	
	<i>Megalops atlantica, leptcephalus</i>	1.8-2.2	
3.	<u>Moved out of Inner and Mid-estuary</u>		
	<i>Anchoa hepsetus</i>	0.2-35.0	
	<i>Lagodon rhomboides</i>	2.2-36.0	
	<i>Orthopristis chrysoptera</i>	7.6-36.0	
4.	<u>Remained in Inner and Mid-estuary</u>		
	<i>Achirus lineatus</i>	0.2-15.0	<0.5%
	<i>Arius felis</i>	0.2-31.8	0.7%
	<i>Bagre marinus</i>	0.2-24.5	<0.5%
	<i>Brevoortia smithi</i>	0.2-4.2	<0.5%
	<i>Caranx hippos</i>	0.2-36.0	<0.5%
	<i>Citharichthys spilopterus</i>	0.2-35.0	<0.5%
	<i>Cynoscion nothus</i>	0.2-12.0	
	<i>Cynoscion regalis</i>	0.2-12.0	<0.5%
	<i>Diapterus plumieri</i>	0.2-8.2	
	<i>Diapterus olithostomus</i>	0.2-25.0	<0.5%
	<i>Dorosoma pentenense</i>	0.2-24.5	1.4%
	<i>Gobiosoma boscii</i>	1.5-15.0	
	<i>Leiostomus xanthurus</i>	1.5-12.0	<0.5%
	<i>Microgobius gulosus</i>	2.5-8.0	
	<i>Micropogon undulatus</i>	0.2-24.5	<0.5%
	<i>Mugil curema</i>	2.2-22.2	
	<i>Trachinotus falcatus</i>	2.8-34.0	<0.5%
	<i>Trinectes maculatus</i>	0.2-12.0	<0.5%
5.	<u>Remained throughout Estuary</u>		
	<i>Anchoa mitchilli</i>	0.2-35.0	60.0%
	<i>Archosargus probatocephalus</i>	2.0-33.0	
	<i>Bairdiella chrysura</i>	0.2-35.0	<0.5%
	<i>Clupeid juveniles</i>	1.5-36.0	10.7%
	<i>Dasyatis sabina</i>	0.2-35.0	<0.5%
	<i>Eucinostomus argenteus</i>	0.2-36.0	2.3%
	<i>Eucinostomus guttatus</i>	0.2-36.0	2.4%
	<i>Eucinostomus sp.</i>	0.2-36.0	5.7%
	<i>Lutjanus griseus</i>	2.0-35.0	<0.5%
	<i>Menidia beryllina</i>	0.2-36.0	11.1%
	<i>Mugil cephalus</i>	0.2-36.0	<0.5%
	<i>Oligoplites saurus</i>	0.2-35.0	
	<i>Sphaeroides testudineus</i>	4.2-36.0	<0.5%
	<i>Sphyraena barracuda</i>	0.2-34.0	
	<i>Strongylura marina</i>	1.5-32.8	<0.5%
	<i>Syngnathus scovelli</i>	2.5-36.0	<0.5%
	Total		>95.4%

* = Range of salinities in which these species were collected during the discharge study.

G = Fish that Gunter (1959) found in the inner and mid-estuary after the region was fresh water for 3 months. The percentage shown reveals the portion of catch for the 2500 cfs discharge investigation.

Note: Fish collected during the study but not listed above include those species that remained in the outer estuary or were rare species not captured frequently enough to detect their movement.

distinctively different. Overall, the cluster analyses (Figures 17 and 18) indicate that the communities, represented by species presence, remained very similar throughout the entire controlled discharge experiment.

The percent presence and numbers of species captured at each station for the 33 most abundant species found throughout the estuary were analyzed. Results of the percent presence analysis for the inner and middle estuary indicate that fish feeding on the lower trophic level became more widely distributed throughout this area during the first two weeks of discharge and then returned to the distributions that existed before the discharge (Table 12). Examination

TABLE 12. COMPARISON OF PERCENT PRESENCE LOWER TROPHIC LEVEL FISH, WITH CHI SQUARE

Date	Population				
	1	2	3	4	5
1 6-14		37.1	37.2	31.9	20.8
2 6-20			10.2*	51.4	40.5
3 6-28				33.3	40.0
4 7-5					30.8
5 7-12					

*No significant difference (95% Confidence Level)

of Figure 19 also reveals that the dispersion occurred mostly among the lower trophic level fish such as *Anchoa mitchilli*, *A. lyolepis*, *A. hepsetus*, *Dorosoma pentenense*, and Clupeid juveniles. Maximum dispersion occurred by 28 June, nine days after the discharge began. The numbers of species captured at individual stations throughout the inner and middle estuary for each sample date were compared (Table 13). The results of this analysis reinforced the fact

TABLE 13. NUMBER OF FISH SPECIES IN THE INNER AND MID ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

Population						
Sta.	Date	6-14	6-20	6-28	7-5	7-12
1S		8	10	4	7	3
1T		9	8	14	10	9
2S		6	8	7	3	6
2T		4	9	10	9	5
3S		5	7	11	8	8
3T		10	15	7	5	11
4S		2	6	8	9	8
4T		9	15	17	11	10
5S		7	7	9	12	7
5T		6	9	12	13	6
6S		7	5	10	9	4
6T		9	10	9	10	5
11S		6	8	13	11	6
MEAN		6.8	9.0	10.1	9.0	6.8
C.V. (%)		33.7	33.6	33.8	30.8	34.7

that the distribution of fish had changed (Tables 13 and 14). The increase in number of species found can be attributed to the introduction of four freshwater species and three species of Elopiformes to the South Fork plus increased distribution of species that were present before the discharge began. The decrease in

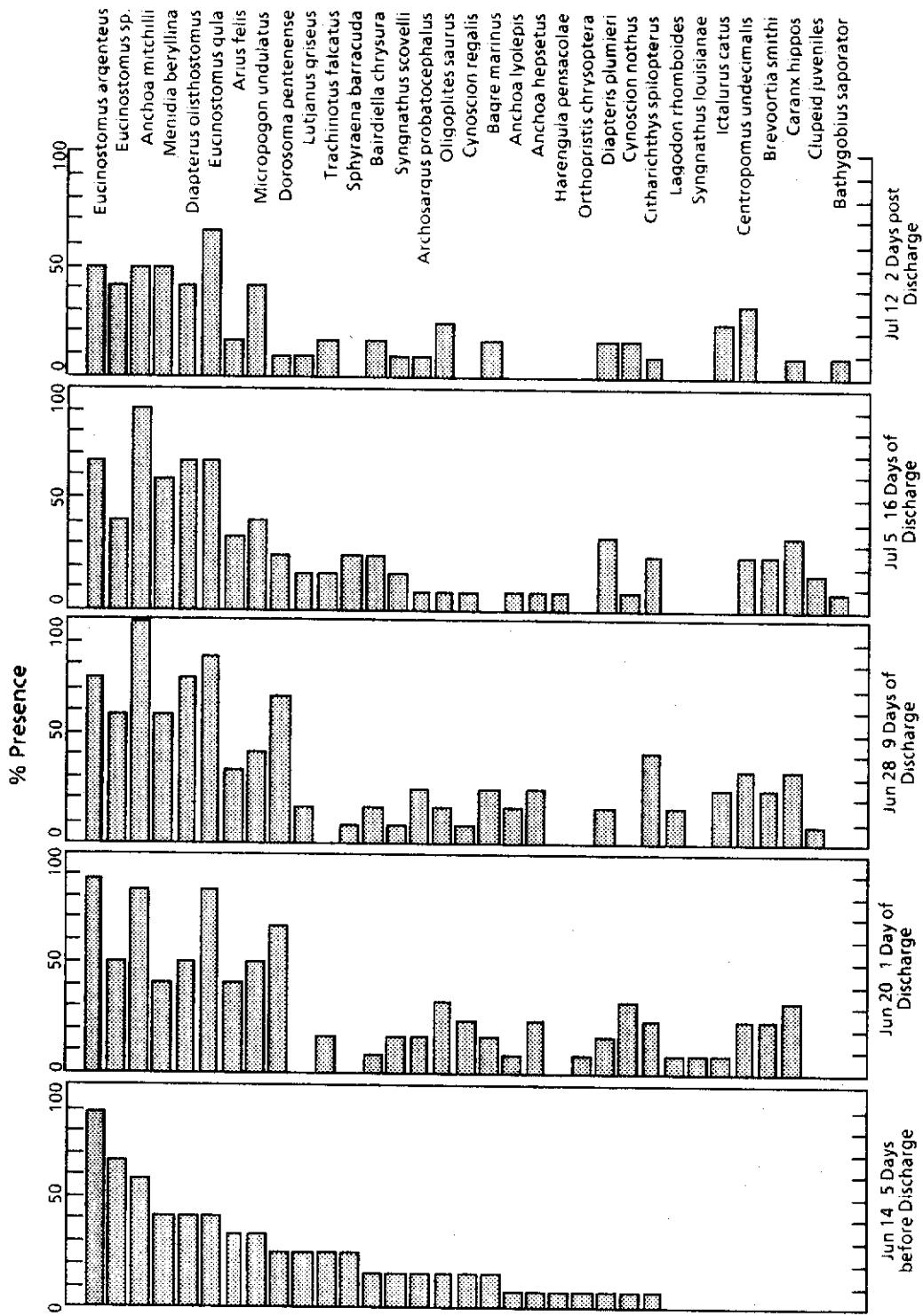


FIGURE 19. PERCENT PRESENCE OF FISH IN THE INNER AND MIDDLE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

the number of species captured at various stations can primarily be attributed to the return of the lower trophic level fish to a distribution similar to that found before the discharge occurred.

TABLE 14. COMPARISON OF THE NUMBER OF FISH SPECIES POPULATIONS WITH t STATISTIC

Sample	1	2	3	4	5
Sets					
1	2.160*	2.912*	2.243*	I.M.	
2		0.853		I.M.	-2.180*
3			-0.885		-2.883*
4					-2.215*
5					

I.M. = Identical Means

* Significant Difference (95% Confidence Level)

Field Observations

Within the first week of 2500 cfs discharge, blooms of blue-green algae (primarily *Anabaena* and *Schizothrix*) occurred in the surface waters of the inner and mid-estuary. The greatest concentrations of these blue-green algae appeared where opposing currents met near Roosevelt Bridge and in windrows in the east-west section of the middle estuary. Surface water algae blooms were no longer apparent during the last week of discharge.

Weekly observations at station 4S of several adult clusters of oysters revealed that individual oysters remained alive throughout the study. By the end of the discharge event, salinity at station 4S was down to 2 ppt, and the oysters were no longer actively feeding.

Discussion

Benthic Macroinvertebrates

The composition of benthic communities in an estuary is influenced by salinity. Estuarine salinities are grouped into four zones that range from nearly fresh water to sea water.

Salinity Zone	Salinity (ppt)
Oligohaline	0.5 to 5.0
Mesohaline	5.0 to 18.0
Polyhaline	18.0 to 30.0
Euhaline	30.0 to 40.0

Prior to the 2500 cfs discharge, the St. Lucie Estuary was characterized by mesohaline conditions in the inner estuary, polyhaline in the middle estuary, and euhaline in the outer estuary (Figure 20A). Although the upper reaches of the North and South Forks were not monitored, oligohaline waters probably existed in these areas where groundwater seepage and freshwater runoff maintain low salinities.

Since many freshwater invertebrates can tolerate oligohaline conditions (Boesch, 1971), the St. Lucie Estuary supported benthic communities that could inhabit the entire range of salinities prior to the experimental discharge.

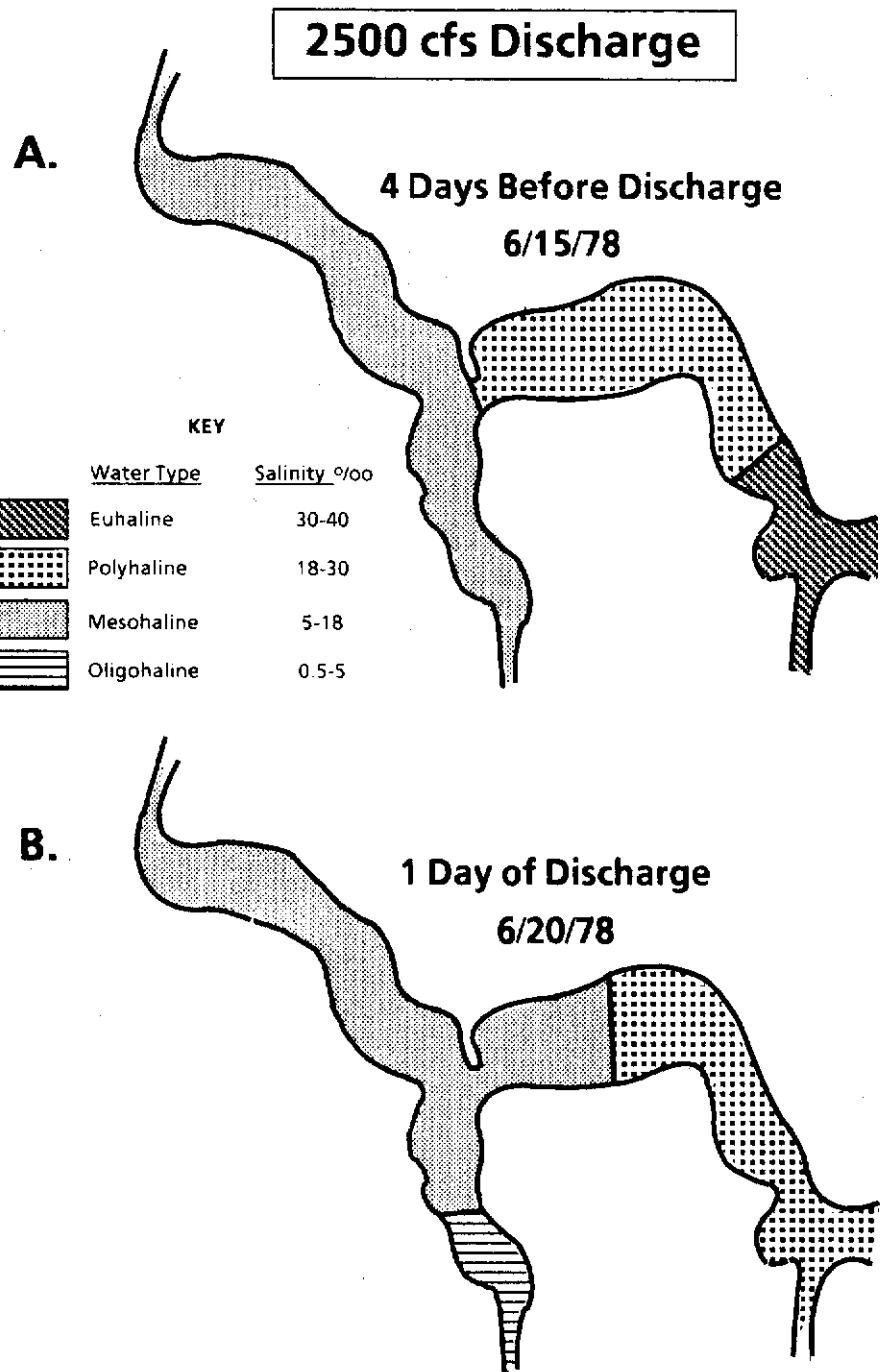
The benthic community in the mesohaline and polyhaline waters consisted of many species that can tolerate stressful environmental conditions and take advantage of habitat that is not favorable to other

benthic organisms. The high organic content in the mud substrates and frequent physical disturbances in the inner and middle estuary are two stressful conditions these species endure. Important adaptive characteristics that allow these species to survive in these areas include: (1) small size; (2) high proportion of resources devoted to reproduction; (3) nearly continuous, prolific reproduction throughout the year; (4) high dispersal ability; (5) primary density-independent mortality; and (6) lack of an equilibrium population size (Rhoads and Young, 1970; McNulty, 1970; Grassle and Grassle, 1974; Tiffany, 1974; Webb, 1976; Diaz and Boesch, 1977; Young and Young, 1977; Deis, 1978; Pearson and Rosenberg, 1978; Hart and Fuller, 1979). Wohsehl and Copeland (1970) demonstrated a gradual reduction in species diversity in benthic communities that are exposed to stress for long periods of time. Only the most adaptable benthic species will survive the stress; the loss of less adaptable species reduces the community diversity. The low species diversity and large number of opportunistic species collected from the mud substrates in the St. Lucie Estuary suggest that this is a stressed system.

Reduction in salinities during the discharge changed the species composition of the benthic communities. As the fresh water penetrated the inner estuary, mesohaline and polyhaline waters were changed to oligohaline. After the first 10 to 14 days of discharge, a salinity equilibrium was established and the oligohaline zone was maintained until 12 July, two days after the discharge stopped (Figures 20B to 22B). The most apparent changes in benthic species composition occurred within the area that became oligohaline (transect 1 to 5). Opportunistic freshwater midge larvae, mostly *Chironomus crassicaudatus*, invaded all of the oligohaline habitat and reached densities as high as 6000/m². Other midge larvae (*Cryptochironomus fulvus*, *Polypedilum halterale*, and *Procladius* sp.) were found in far fewer numbers only in the South Fork where freshwater conditions were present for the longest period. The estuarine polychaete, *Streblospio benedicti*, dramatically increased in density, and the previously dominant clam, *Mulinia lateralis*, and the amphipod, *Ampelisca abdita*, were virtually absent from the newly created oligohaline zone. This new zone, however, was formed during the first few weeks of discharge and it is during this time that most of the benthic community changes probably occurred. *M. lateralis* (coot clam) probably perished from low salinity. The dominant amphipod *A. abdita* has been shown to migrate to more suitable environments when subjected to stress from increased turbidity and/or reduced salinities (Farrow, 1984).

Fish

The fish community in the inner and middle estuary was characterized by a small number of species prior to the discharge. Of these species, the fish that feed at the lower trophic levels were dominant. This type of community structure is often encountered in the South Atlantic Estuarine Region (Livingston, 1976). *Anchoa mitchilli* (bay anchovy) was the most abundant species in this study and is generally the most common fish found within the South Atlantic Region when seines and trawls are used for sampling (Swingle, 1971). The bay anchovy is well adapted to conditions within the St. Lucie Estuary because it can tolerate wide salinity and temperature variations and periods of low food availability. It also has a long spawning season so



**FIGURE 20. SALINITY ZONES IN THE ST. LUCIE ESTUARY
DURING THE 2500 CFS DISCHARGE STUDY**

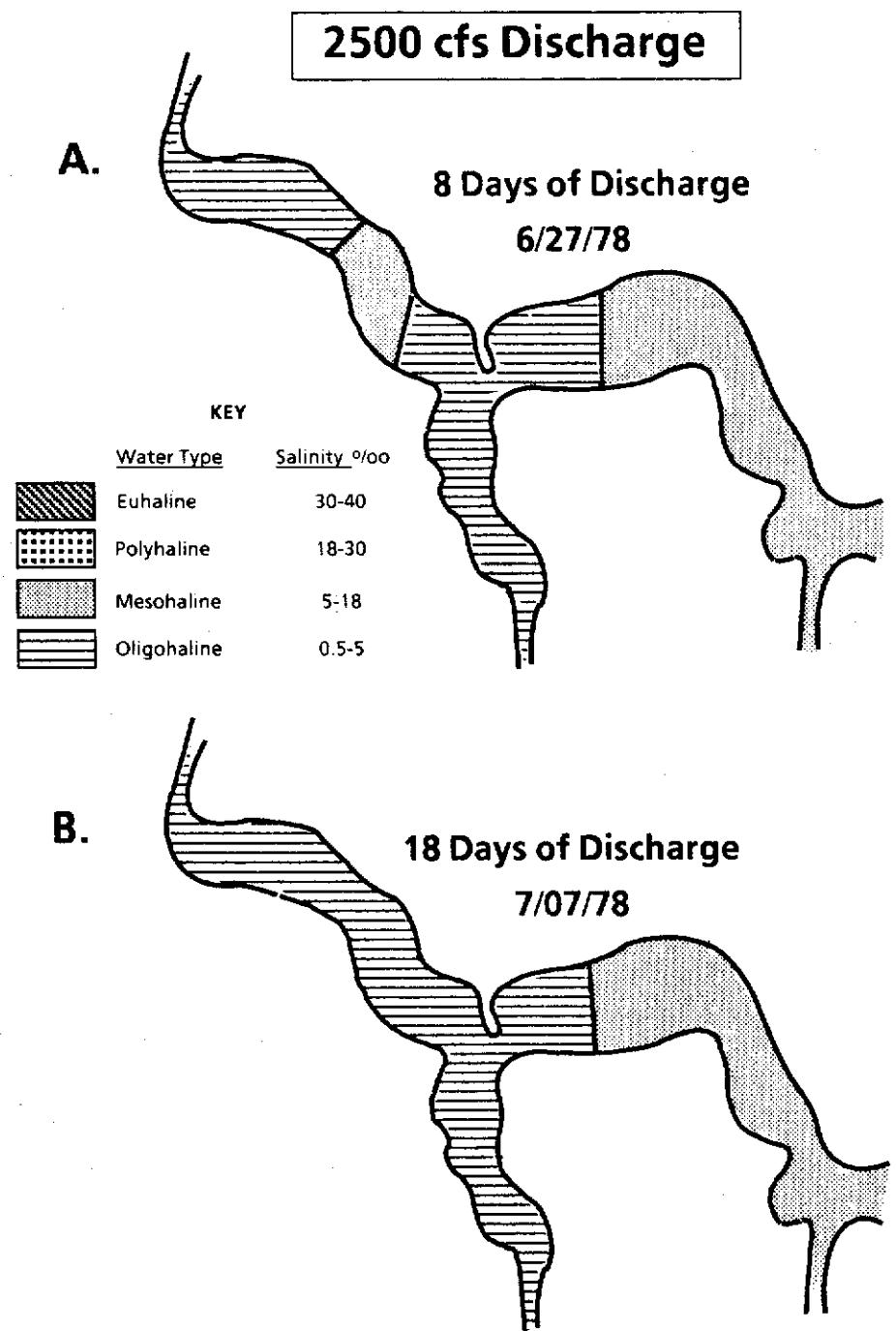


FIGURE 21. SALINITY ZONES IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

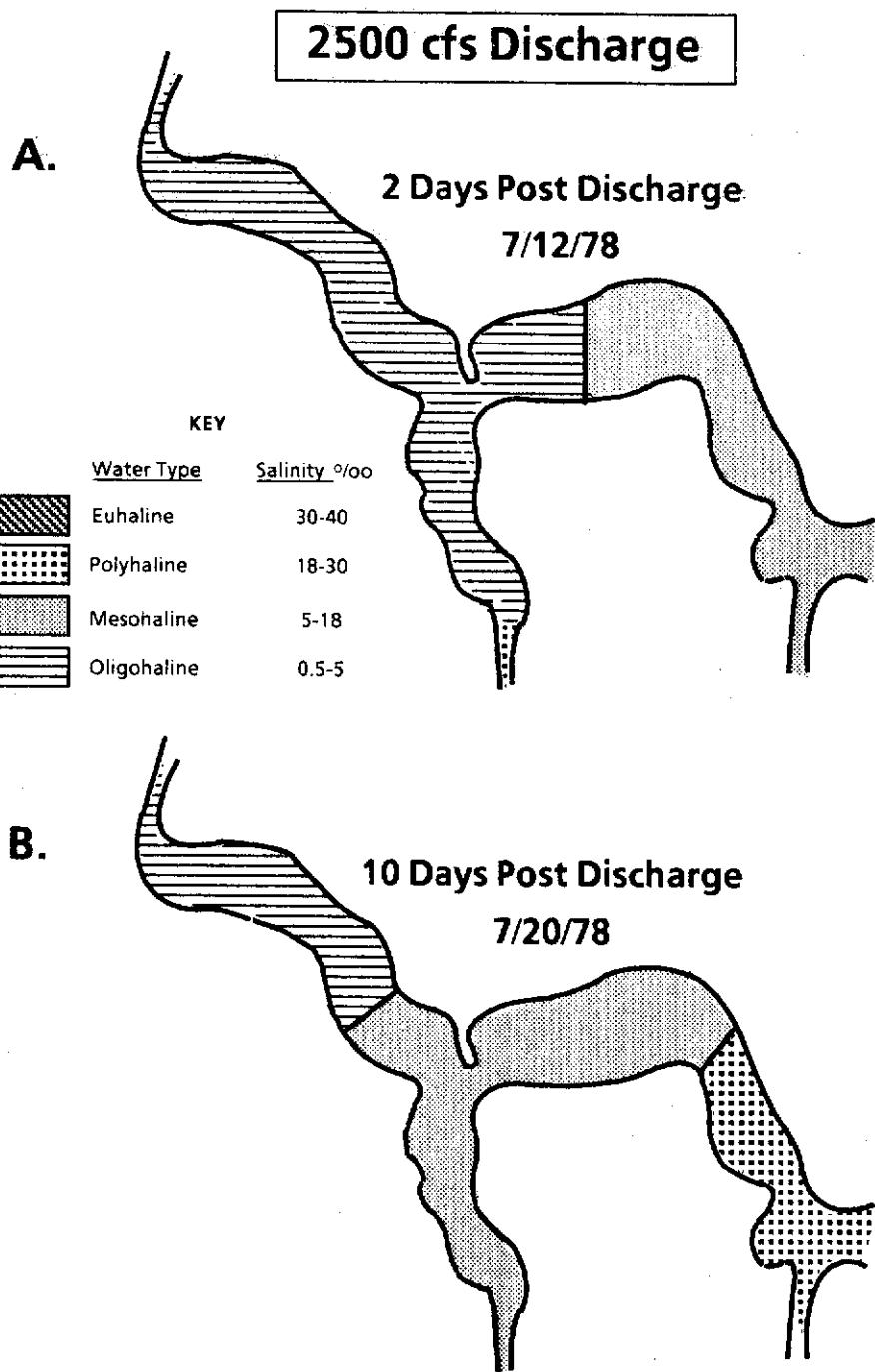


FIGURE 22. SALINITY ZONES IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

that juvenile recruitment occurs throughout the year (Bechtel and Copeland, 1970). Fishes that feed at the lower trophic levels such as *Anchoa* spp., *Dorosoma pentenense* (threadfin shad), *Harengula pentenense* (scaled sardine), and *Brevoortia smithi* (yellowfin menhaden) in the St. Lucie Estuary, generally make up the greater portion of the fish biomass of most estuarine areas. These fish utilize a diverse food supply and can be classified as herbivores, detritivores, omnivores or primary carnivores (mostly zooplankton feeders like *Anchoa* spp.). Day, et. al., (1973a) showed that this group of fishes accounted for more than 75% of the total biomass in Barataria Bay, Louisiana.

Mid-trophic level carnivores encompass a relatively large number of fishes that feed mainly on macrobenthic and microbenthic organisms and small fishes. The most abundant, mid-trophic species were *Menidia beryllina* (tidewater silverside), *Eucinostomus* spp. (mojarras), *Micropogon undulatus* (croaker), *Arius felis* (sea catfish), and *Diapterus olistostomus* (irish pompano).

The higher trophic level of fishes, which feed mainly on lower trophic level fishes and macrobenthic organisms like crabs and shrimp (Day, et. al., 1973a), were represented primarily by *Cynoscion* spp. (trout), *Lutjanus griseus* (gray snapper), *Sphyraena barracuda* (barracuda), and *Centropomus undecimalis* (snook).

During the discharge, four species of freshwater fish were introduced from upstream. Further, the fresh water coming into the South Fork appeared to attract the larvae of tarpon, bonefish, and ladyfish. Otherwise the fish species that were found throughout the estuary before the discharge were very similar to the species that were collected during and after the releases. Springer (1960) found no significant differences in species composition in the inner estuary during periods of zero, 4000 cfs, and 7000 cfs discharges from S-80. Murdock (1954), however, concluded from interviews with local, commercial, and recreational fishermen that adult predatory fish such as sea trout, bluefish, pompano and mackerel "...avoid the fresh water outflow from the canal and during periods of water release commercial fishing is driven temporarily out of the estuary."

Results of the 2500 cfs discharge study showed that the lower trophic level fish were more widely distributed in the inner and middle estuary during the first two weeks of discharge and then returned to about the distribution that existed before the discharge. This change in distribution may be related to the changes that occurred in the benthic communities and in water quality.

During the first two weeks of discharge the oligohaline zone increased in area. The amphipod, *A. abdita* entered the water column in large numbers seeking a more suitable environment. In addition, a "population explosion" of midge larvae occurred. These invertebrates were widely distributed in the inner and middle estuary and became highly susceptible to fish predation. The resuspended sediments, resulting from increased water velocities in the narrows of the South Fork, undoubtedly contained other benthic species and organic material which were distributed throughout the inner estuary. From the results presented in Figure 14, it appears that the initial increase in nitrogen was due to the liberation of interstitial water from the physical action of the discharge. This nitrogen increase was associated with a

bloom of blue-green algae (primarily *Anabaena* and *Schizo-thrix*) in the inner and middle estuary. These factors provided the lower trophic level fish with a rapid increase in food supply that was well distributed throughout the oligohaline zone. A recent study of the bay anchovy documented the opportunistic feeding behavior of this fish in the St. Lucie Estuary (unpublished study by the South Florida Water Management District). Before a large regulatory discharge began, the diet of the bay anchovy consisted primarily of ostracods and copepods. All of these specimens were collected from a mesohaline habitat. After about a month of discharge, gut analyses revealed that freshwater midge larvae and unidentifiable organic material were the primary food for the bay anchovy within oligohaline waters.

The increased distribution of opportunistic feeding fish during the formation of an oligohaline environment was probably a response to the dispersion and availability of food organisms and organic materials. The return of these fish to the previous distribution occurred after the oligohaline character of the estuary had been established and most of the changes in the benthic community had probably taken place.

Importance of Antecedent Conditions

The reduction in salinities to an oligohaline habitat causes changes in the distribution and composition of benthic and fish communities. Therefore, from a salinity perspective, the effects of discharges from S-80 cannot be adequately assessed unless the antecedent conditions are known. For example, antecedent salinity conditions were documented prior to a 1000 cfs discharge from S-80 that began on 20 June 1977 (Figure 23A). The inner estuary and about half of the middle estuary were polyhaline (18 to 30 ppt). After 21 days of discharge, only a small portion of the South Fork was oligohaline (Figure 23B). The most significant biological changes in that study occurred only within the South Fork benthic communities (Haunert and Startzman, 1980). If the inner estuary had been mesohaline before the 1000 cfs study, as it was when the 2500 cfs study began, 21 days of 1000 cfs discharge may have transformed the whole inner estuary into an oligohaline environment and the benthos and fish would have responded accordingly.

Seasonal Variation in Freshwater Flow

Two of the most important factors in determining productivity of an estuary are the presence of a long growing season together with distinct seasonal pulses of freshwater input (Day et. al., 1973a). Under natural conditions, the St. Lucie Estuary meets these conditions by having relatively warm waters for most of the year, and seasonal rainfall events that cause transient variations of water and nutrient flow into the system. As with the 1000 cfs and 2500 cfs experimental discharges from S-80, these natural pulses of fresh water initially provide nutrients for primary production and reduce salinities to create oligohaline environments. Conversely, prolonged regulatory releases from S-80 can create an extended area of fresh water and oligohaline habitat for the duration of the discharge, which is detrimental to the estuary. The natural pulses provide transient fresh water and oligohaline conditions in a limited area of the inner estuary. Many sessile species of benthic invertebrates are able to tolerate transient fresh water

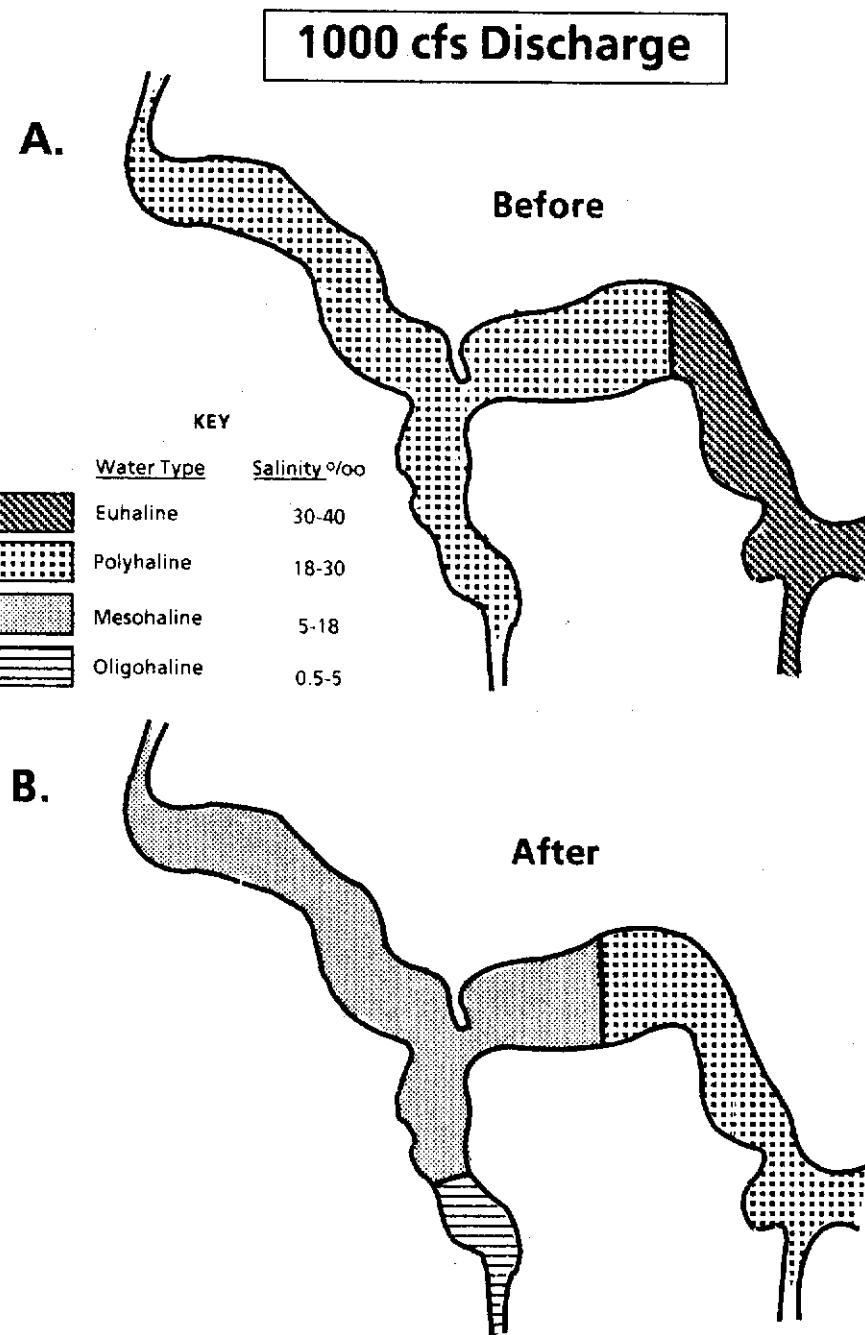


FIGURE 23. SALINITY ZONES IN THE ST. LUCIE ESTUARY BEFORE (6/17/77) AND AFTER (7/11/77) THE 1000 CFS DISCHARGE STUDY

conditions but will not survive sustained fresh water exposure. The oyster, for example, usually thrives in low salinity conditions (5 to 15 ppt), where disease and predators are normally absent. However, if oysters are subjected to more than several days of fresh water they can no longer osmoregulate and will perish. Oysters were not collected as part of the benthic samples in this study but field observations of several small clusters in the South Fork (near station 4S) revealed that these oysters were alive after the 2500 cfs discharge. The salinity in this area did not become low enough to be considered fresh water (less than 0.5 ppt), even though it was oligohaline. However, if the discharge had continued for about 10 more days, this area would have become fresh water according to a

simulation produced by the hydrodynamic-salinity model (DYNTRAN version II) which was verified by the District. Previous regulatory discharges have been large enough and have lasted long enough to make the inner, and part of the middle estuary, fresh water. The loss of oyster reefs induces major biological changes since these reefs provide food for fish (such as the once abundant black drum) in the St. Lucie Estuary and vital habitat for numerous organisms (Huner, 1978; Day et. al., 1973b). Oyster populations in the estuary have been severely reduced due to the continual exposure to fresh water and the lack of suitable substrate (clean, hard objects) for settling of oyster larvae when reef regeneration is possible.

SUMMARY OF RESULTS

Turbidity

Before the discharge began maximum turbidity occurred where the estuary widens in the North Fork and South Fork. After the discharge began turbidity increased substantially in the South Fork and just downstream of the Roosevelt Bridge. Turbidity in the Indian River was not affected by the discharge.

Salinity

A linear salinity gradient existed from the inner estuary to the St. Lucie Inlet prior to the controlled freshwater releases. Salinities began to decline in the outer estuary by the eighth day of discharge. After about 10 days of discharge, a well-defined salt wedge was formed in the middle estuary which showed little movement for the remainder of the study. Salinities inland of the salt wedge were below 5 ppt.

Temperature

Before the discharge an average temperature gradient of about 4.0°C existed from the inner estuary eastward to the St. Lucie Inlet. As the discharge proceeded, temperatures became more uniform throughout the estuary while steadily increasing as summer progressed.

Dissolved Oxygen

Dissolved oxygen was highly stratified in the inner and middle estuary before the discharge. This stratification was lost in the South Fork at the onset of the discharge and these waters became highly oxygenated during the discharge. However, D.O. near the bottom was substantially reduced where the salt wedge persisted in the middle estuary.

Nutrients

A dramatic increase in nitrogen levels occurred at S-80 at the beginning of the discharge. Nitrogen concentrations decreased to levels found before the discharge within one week. Ortho-phosphorus levels showed a marked decrease to levels that were the same as those in Lake Okeechobee after the third day of discharge.

Benthic Macroinvertebrates

The highest densities of benthic invertebrates were present in the inner and middle estuary both before and after the discharge. However, an overall reduction in densities of 44% occurred during the discharge. The greatest change in benthic species composition occurred in the newly-created oligohaline zone (0.5 to 5 ppt) of the estuary within the first few weeks of discharge. Freshwater midge larvae, *Chironomus crassicaudatus*, increased dramatically and the estuarine polychaete, *Streblospio benedicti* also increased in number. Additionally, six freshwater species were introduced and at least four estuarine species were lost from the oligohaline zone.

Fishes

The fish community in the inner and middle estuary was represented by a few species, dominated by fishes that feed at the lower trophic level. Shallow, grassbed communities in the outer estuary had the greatest diversity of fish. During the discharge, four species of freshwater fish were introduced from upstream into the oligohaline waters. The larval stages of three primitive species (bonefish, ladyfish, tarpon) were captured in the inner estuary after the discharge began. Three species of fish including striped anchovy, pigfish, and pinfish avoided the lower salinity water. In spite of the apparent movements, fish communities throughout the estuary remained very similar during the entire controlled discharge experiment.

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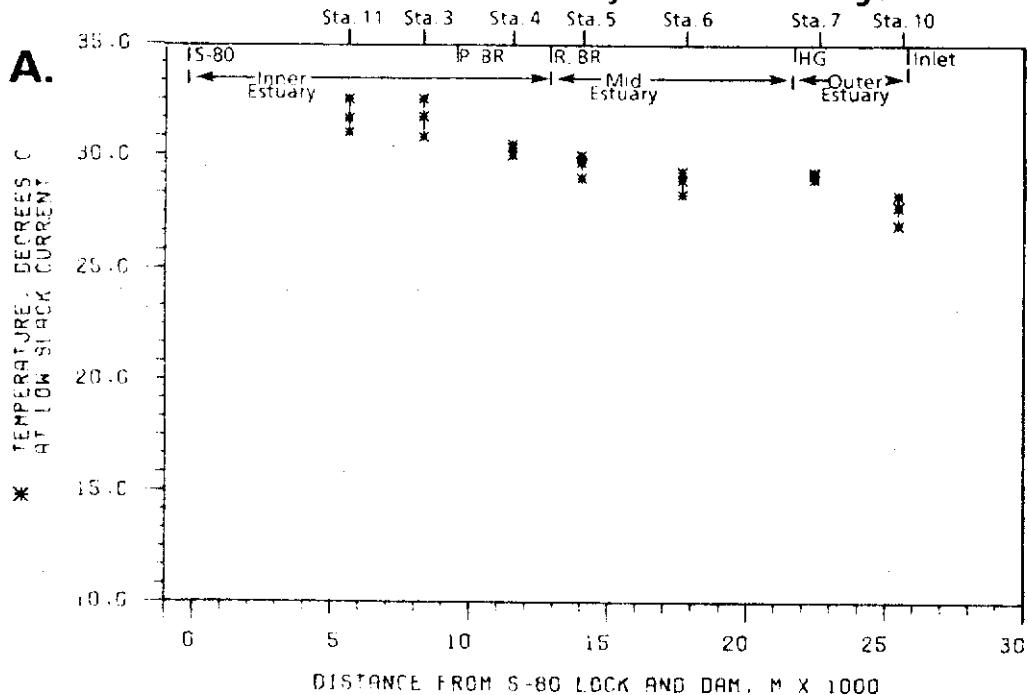
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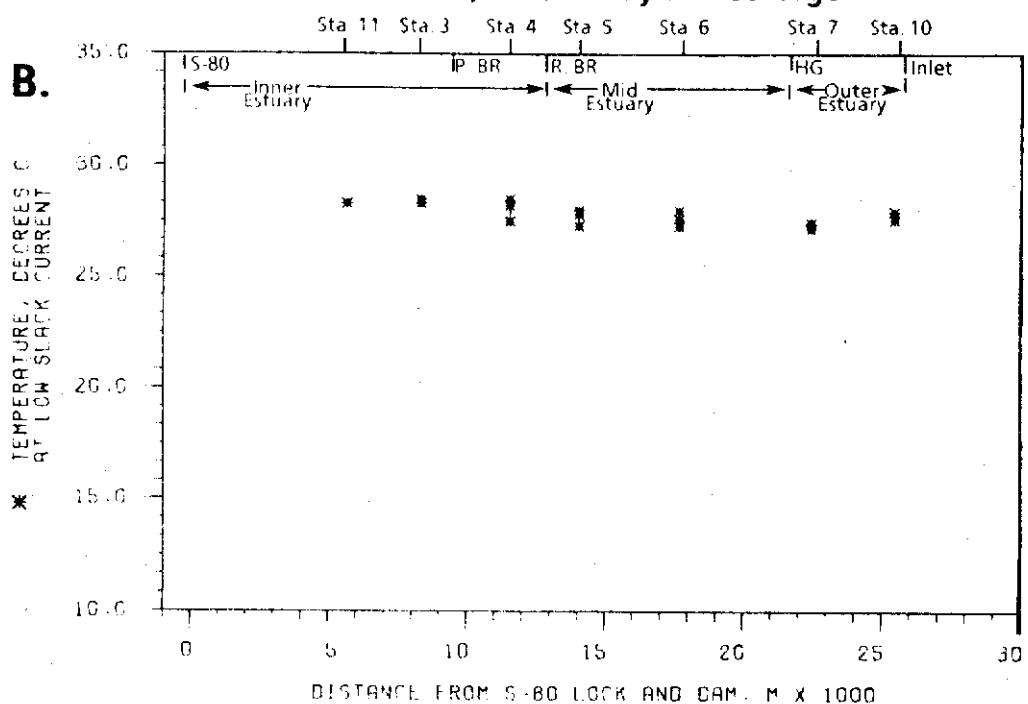
APPENDIX A

TEMPERATURES IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS EXPERIMENTAL DISCHARGE

June 15, 1978--4 Days Before Discharge



June 20, 1978--1 Day of Discharge

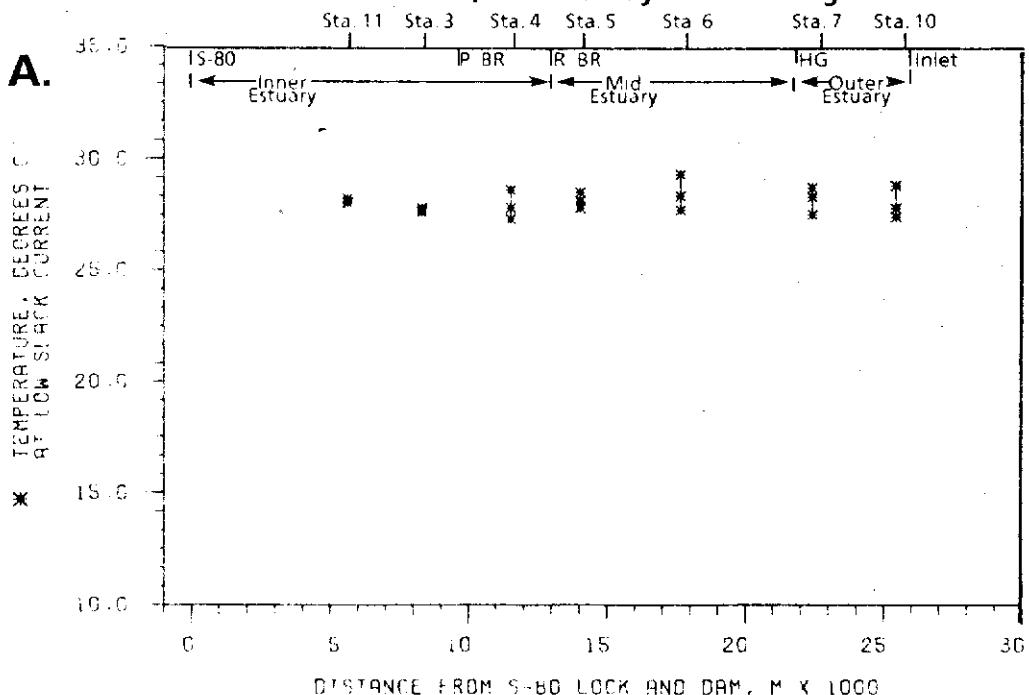


KEY
 K BR Kellstadt Bridge P BR Palm City Bridge
 R BR Roosevelt Bridge HG Hellgate

* Maximum
 + Mean
 - Minimum

FIGURE A-1. TEMPERATURES IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

June 27, 1978--8 Days of Discharge



July 7, 1978--18 Days of Discharge

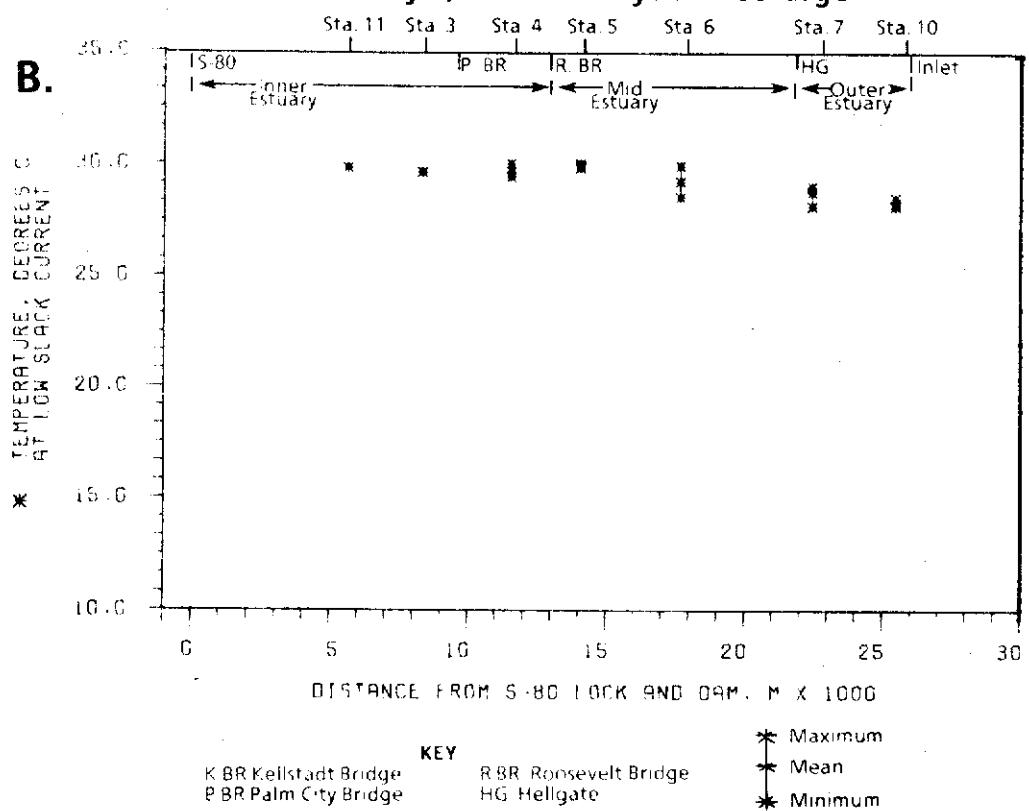
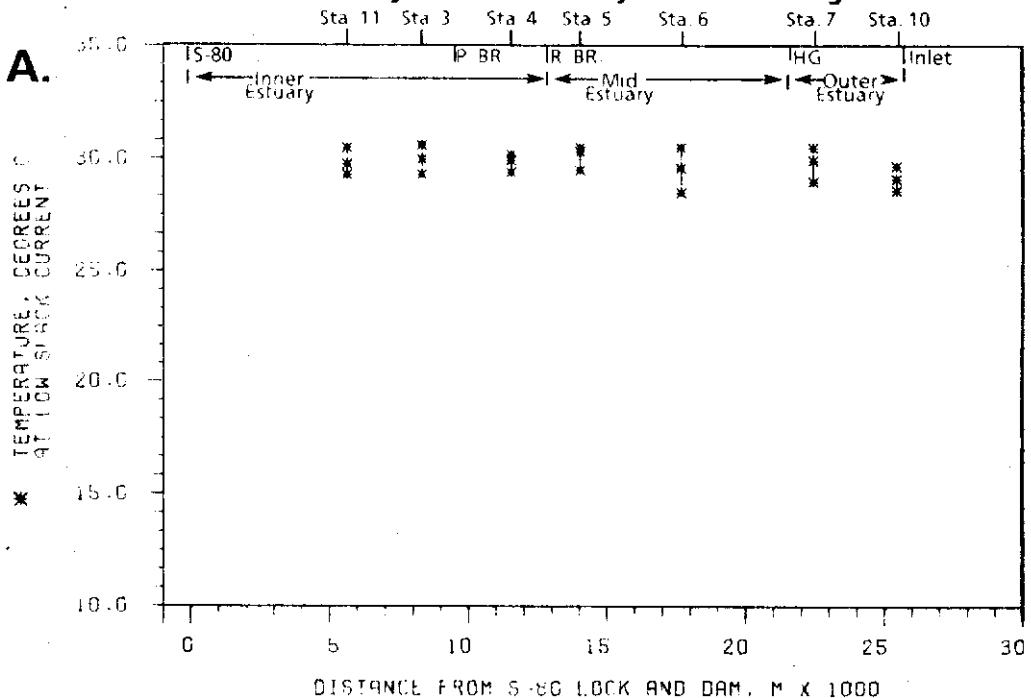


FIGURE A-2. TEMPERATURES IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

July 12, 1978--2 Days Post Discharge



July 20, 1978--10 Days Post Discharge

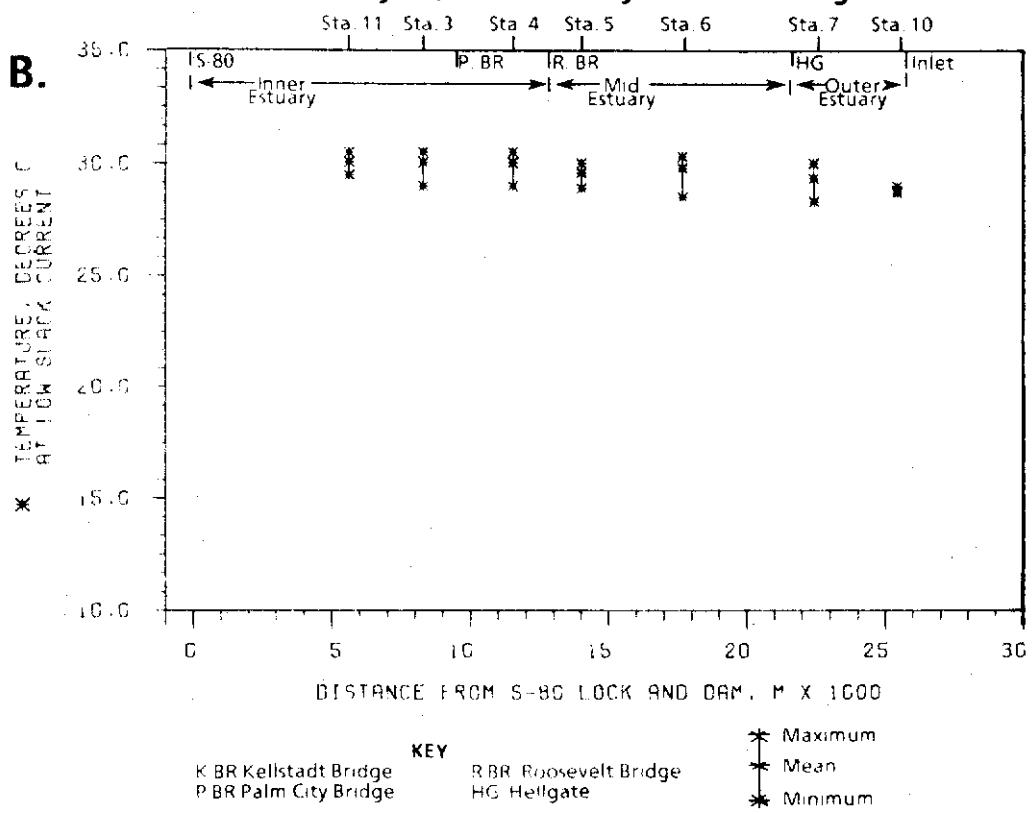


FIGURE A-3. TEMPERATURES IN THE ST. LUCIE ESTUARY DURING THE 2500 CFS DISCHARGE STUDY

**TEMPERATURE IN THE NORTH FORK AND AT STATIONS 8C
AND 9C DURING THE 2500 cfs DISCHARGE STUDY.**

<u>Station</u>	<u>Date</u>	<u>Mean</u>	<u>Min.</u>	<u>Max.</u>
NORTH FORK				
1C	6/15	28.5	28.3	29.0
	6/20	28.1	27.5	28.5
	6/27	28.7	28.0	29.0
	7/7	29.5	28.7	30.1
	7/12	30.1	29.4	30.5
	7/20	30.1	30.0	30.1
2C	6/15	28.8	28.3	29.6
	6/20	28.0	27.6	28.5
	6/27	28.8	27.6	29.5
	7/7	30.1	29.6	30.5
	7/12	30.0	29.5	30.4
	7/20	29.9	29.5	30.0
OUTER ESTUARY				
8C	6/15	27.1	27.0	27.3
	6/20	27.0	26.8	27.3
	6/27	27.9	27.6	28.4
	7/7	28.6	28.6	28.6
	7/12	29.7	29.6	29.8
	7/20	29.2	29.0	29.5
9C	6/15	27.9	27.8	28.0
	6/20	27.7	27.6	27.7
	6/27	27.7	27.5	28.0
	7/7	28.4	28.0	28.5
	7/12	29.3	29.0	29.7
	7/20	29.2	28.9	29.5

APPENDIX B

QUANTITATIVE LISTING OF BENTHIC FAUNA BEFORE AND AFTER 2500 CFS DISCHARGE

	S	C	X	S	C	X	S	C	X	S	C	X	S	C	X	S	C	X	S	C	X
	1	2	x	3	4	x	5	6	x	7	8	x	9	10	x	11	12	x	13	14	x
Class Polychaeta																					
<i>Cirratulus</i> sp.																					
<i>Cirriformia</i> sp.																					
<i>Glycinde solitaria</i>	3	7	3	1	4	1	4	13	1	9	3	2	14	16	2	10	1	7	4	2	7
<i>Nereis</i> sp.	3	1	5	1	3	4	2	15	2	10	1	7	3	6	12	3	1	1	2	1	1
<i>Nereis succinea</i>	5	1	1	4	3			2				1									
<i>Diopatra cuprea</i>																					
<i>Omphis</i> sp.																					
<i>Armandia</i> sp.																					
<i>Haplocoloplus</i> sp.																					
<i>Haplocoloplus foliosus</i>																					
<i>Pectinaria gouldii</i>	1	6	1	2	1			1					1			1					
<i>Parapriionospio pinnata</i>	1	1	57	3	3			2	3	2	1	3	3	4	10	4					
<i>Streblospio benedicti</i>	9	6	2	13	1	2	152	5	3	20	61	21	382	18	15	3	2				
<i>Syllis</i> sp.																					
<i>Tubifex tubifex</i>								2													
Class Gastropoda																					
<i>Acteocina canaliculata</i>																					
<i>Haminoea succinnea</i>																					
<i>Anachis obesa</i>																					
<i>Mitrella lunata</i>																					
<i>Pyrgophorus platyrachis</i>																					
<i>Neritina virginea</i>																					
<i>Melanoides tuberculata</i>																					

	1 S C	2 C X	3 C X	4 C X	5 C X	6 C X	7 C X	8 C X	9 C X	10 C X
Class Pelecypoda										
<i>Barbatia candida</i>										
<i>Crassimella lunulata</i>										2
<i>Donax variabilis</i>										22
<i>Divaricella quadrisolata</i>										
<i>Lucina pectinata</i>										
<i>Lucina sp.</i>										4
<i>Lyonsia tyalina</i>										
<i>Mulinia lateralis</i>	403 12	303 8	28 9	735 12	307 2	169 6	173 1	181 1	156 3	184 1
<i>Myogdium papyrum</i>	197 35	35 6	5 2	1 1		1 5			953 56	265 141
<i>Brachidontes dominicensis</i>	327 28					1 2			206 67	101 99
<i>Mytilopsis leucophaeta</i>									96 37	86 14
<i>Tegulus plebeius</i>									10 1	10 1
<i>Macoma tenta</i>	3 1		1 5			1 1			161 161	164 2
<i>Tellina sp.</i>										1
<i>Chione cancellata</i>										4
<i>Chione grus</i>										1
<i>Chione intapurpurea</i>										1
<i>Anomalocardia subterfana</i>										1
Class Crustacea										
<i>Hysis stenolepis</i>									2 8	1
<i>Hysis sp.</i>										1
<i>Mysidopsis bigelowi</i>	1 1	2 1	3 1			6 1	1 1	1 1	7 2	1 1
<i>Diatomis sp.</i>									1 1	3 2
<i>Oxyurostyliis sp.</i>									1 1	1 1
<i>Cyathura polita</i>									1 1	2 1
<i>Ectoea sp.</i>	3 6	6 2	1 3						2 3	4 1

6-13-78 X
X 7-10-78

	1 S C	2 C X	3 S C	4 S C	5 S C	6 S C	7 S C	8 S C	9 S C	10 S C
Munna reynoldsi	4 5									
Sphaeromia destructor	190 7	51 386	196 1	104 41	147 41	250 6	4 31	739 9	130 8	43 1
Ampelisca abdita										
Caprella sp.	159 18	28 32	33 47	19 24	211 103	354 141	2 2	33 48	4 375	1 1
Ceratopus sp.	32 54	2 54								
Cornophium acherusicum										
Gammarus fasciatus										
Bathyperaria sp.										
Haustorius sp.										
Platyischnopus sp.										
Leptochelia savignyi	6 2	32 26	16 57	6 3	237 22	3 2	38 2	1 3	12 3	1 2
Alphaeus sp.										
Callinectes sapidus										
Eurypanopeus sp.										
Balanus sp.	17 65									
Class Insecta										
Callicebetis floridanus										
Chaoborus punctipennis	1 1									
Chironomus crassicaudatus	4 6	161 29	309 1	23 9	85 2	154 17	2 2			
Cryptochironomus fulvus										
Polypodium halterale										
Procladius sp.										
Class Osteichthyes										
Gobionellus sp.	16 13	9 3	7 5	11 9	12 9	10 6	9 5	11 10	10 4	13 7
Number of sp./station	102 67	856 38	134 162	220 68	747 396	740 584	175 579	118 118	165 160	136 136
Total no. of ind./station										

6-13-78 X
X-10-78

APPENDIX C

FISH CAPTURED DURING THE 2500 CFS DISCHARGE STUDY

TAXON NUMBER	TOTAL IND.	PHYLOGENETIC SORT OF 2500+ FISH DATA BY TAXON, STATION, AND DATE.										NO. OF GENUS INITIAL AND SPECIES NAME	04/14/80	
		TOTAL SIZE	NO. IND. CLASSI	SIZE NO. IND. CLASSI	SIZE NO. IND. CLASSI	STATION NUMBER	DATE MO./DAY/YR	TEMP C	SAL TOP	SAL BOT	TOP C TOP			
508005050104	1	165	0	1	0	0	0	0	0	17	07/12/8	30.5	02.0	
508005050104	1	145	0	1	0	0	0	0	0	17	07/12/8	31.2	00.5	
508005050104	1	147	0	1	0	0	0	0	0	51	06/14/8	32.5	15.0	
508005050104	1	135	6	1	0	0	0	0	0	51	07/05/8	32.2	00.0	
508005050104	1	145	0	1	0	0	0	0	0	AT	06/14/8	31.5	24.5	
508005050104	1	130	0	1	0	0	0	0	0	45	06/20/8	30.0	34.0	
504104010102	1	28	0	1	0	0	0	0	0	75	06/21/8	29.0	00.2	
504104010102	2	24	0	2	0	0	0	0	0	75	07/05/8	33.2	01.5	
508104010202	2	22	13	2	0	0	0	0	0	75	06/28/8	30.8	01.8	
508104010202	1	14	0	1	0	0	0	0	0	55	06/28/8	32.0	02.0	
504104010202	3	22	0	1	0	0	0	0	0	115	06/28/8	30.5	02.2	
504104020102	1	22	0	1	0	0	0	0	0	45	07/13/8	31.5	02.2	
508104020102	2	25	26	2	0	0	0	0	0	115	06/28/8	30.5	02.2	
504107010000	2	20	21	2	0	0	0	0	0	45	07/05/8	33.2	01.5	
508107010000	9	19	24	9	0	0	0	0	0	95	06/20/8	30.0	35.0	
504107010000	1	20	0	1	0	0	0	0	0	95	07/06/8	33.0	16.0	
508107010000	4	18	0	3	25	6	1	0	0	95	07/12/8	31.0	15.5	
508107010000	4	15	19	4	0	0	0	0	0	105	06/20/8	31.2	36.0	
508107010000	4440	19	26	4440	0	0	0	0	0	105	07/06/8	27.0	35.8	
504107010000	2	10	13	2	0	0	0	0	0	105	07/14/8	31.8	26.0	
504107010000	15	16	22	15	0	0	0	0	0	115	06/28/8	30.5	02.2	
504107010000	14	17	20	14	0	0	0	0	0	115	07/05/8	33.2	04.2	
504107010203	2	34	46	2	0	0	0	0	0	37	06/21/8	29.0	00.2	
508107010203	1	29	0	1	0	0	0	0	0	47	06/21/8	29.5	02.2	
504107010203	7	28	14	7	15	0	1	0	0	47	06/24/8	30.8	02.0	
508107010203	7	28	14	3	51	54	3	73	0	1	47	07/05/8	32.0	03.2
508107010203	3	30	0	1	44	64	2	0	0	57	07/05/8	32.2	00.0	
504107010203	1	55	0	1	0	0	0	0	0	65	06/28/8	31.0	04.2	
508107010203	2	29	30	2	0	0	0	0	0	115	06/21/8	29.0	00.2	
508107010203	2	35	37	2	0	0	0	0	0	115	06/28/8	30.5	02.2	
508107010401	2	20	24	2	0	0	0	0	0	35	06/28/8	30.8	01.8	
508107010401	2	34	17	2	0	0	0	0	0	37	06/21/8	29.0	00.2	
508107010401	2	35	37	2	0	0	0	0	0	37	06/21/8	29.0	00.2	
504107010402	1	51	0	1	60	51	2	0	0	0	115	06/28/8	30.5	02.2
508107010402	17	36	46	13	0	0	0	0	0	17	06/21/8	30.5	08.2	
508107010402	1	51	0	1	0	0	0	0	0	25	06/14/8	31.0	08.0	
504107010402	67	35	57	67	0	0	0	0	0	27	06/21/8	29.5	11.2	
508107010402	1	52	0	1	0	2	0	0	0	27	06/28/8	31.2	05.5	
508107010402	27	23	39	27	0	0	0	0	0	35	06/21/8	29.0	00.2	
508107010402	25	18	22	6	26	34	19	0	0	35	06/28/8	30.8	01.8	
508107010402	2	50	52	2	0	0	0	0	0	37	06/14/8	32.5	12.0	
508107010402	132	30	62	132	0	0	0	0	0	37	06/21/8	29.0	00.2	
508107010402	3	32	43	3	0	0	0	0	0	37	06/28/8	30.5	02.0	
508107010402	19	34	55	19	0	0	0	0	0	37	06/28/8	30.5	02.0	
504107010402	27	26	34	21	40	47	4	62	82	2	47	06/21/8	29.5	02.2
508107010402	87	27	42	50	41	73	36	75	0	1	47	06/28/8	30.8	02.0
508107010402	1	50	0	1	0	0	0	0	0	57	06/21/8	30.0	08.0	
504107010402	30	38	50	10	0	0	0	0	0	57	06/28/8	31.0	05.5	
508107010402	27	32	34	16	45	61	11	0	0	57	07/05/8	32.2	00.0	
508107010402	2	50	57	2	0	0	0	0	0	57	07/13/8	31.2	05.0	
504107010402	2	37	50	2	0	0	0	0	0	57	06/14/8	31.5	24.5	
504107010402	1	65	0	1	0	0	0	0	0	67	06/21/8	00.0	00.0	
508107010402	2	35	44	2	0	0	0	0	0	67	06/28/8	31.5	04.5	
508107010402	2	29	45	2	0	0	0	0	0	115	06/21/8	29.0	00.2	

TAXON NUMBER	GENUS-SPECIES	TOTAL SIZE	NO. IND.	SIZE NO. IND.	SIZE NO. IND.	STATION	DATE	TEMP	SAL	SAI	NO. OF GENUS INITIAL AND	SPECIES NAME	84/14/90	
504107010602	G. PENTENIF	75	27	40	75	0	0	0	0	0	115	06/28/8	30.4 02.2	
504107010602	G. PENTENIF	21	25	12	21	0	0	0	0	0	115	07/05/8	33.4 04.2	
504107010603	H. PENSACOLAE	1	64	0	1	0	0	0	0	0	45	05/14/8	32.5 25.0	
504107010603	H. PENSACOLAE	37	26	36	37	0	0	0	0	0	45	05/29/8	32.5 14.5	
504107010603	H. PENSACOLAE	11	24	34	11	0	0	0	0	0	95	07/06/8	33.0 16.0	
504107010603	H. PENSACOLAE	77	27	35	77	0	0	0	0	0	105	06/27/8	32.5 14.5	
504107010603	H. PENSACOLAE	1	32	0	1	0	0	0	0	0	115	07/05/8	33.4 04.2	
504107010602	H. PENSACOLAE	1	56	0	1	0	0	0	0	0	75	06/28/8	30.4 02.2	
504107010602	H. OGLINUM	2	32	0	2	0	0	0	0	0	115	07/05/8	33.4 04.2	
504107020106	A. HERSETUS	1	37	0	1	0	0	0	0	0	25	06/21/8	29.4 11.2	
504107020106	A. HERSETUS	1	43	0	1	0	0	0	0	0	45	06/21/8	29.4 02.2	
504107020106	A. HERSETUS	1	44	0	1	0	0	0	0	0	45	06/28/8	30.4 02.2	
504107020106	A. HERSETUS	1	37	0	1	0	0	0	0	0	45	06/21/8	29.4 02.2	
504107020106	A. HERSETUS	2	38	41	2	0	0	0	0	0	55	06/28/8	32.0 02.0	
504107020106	A. HERSETUS	1	52	0	1	0	0	0	0	0	55	07/05/8	32.4 00.0	
504107020106	A. HERSETUS	4	38	50	6	0	0	0	0	0	45	06/14/8	32.5 25.0	
504107020106	A. HERSETUS	1	28	0	1	0	0	0	0	0	45	06/28/8	31.0 04.2	
504107020106	A. HERSETUS	4	32	51	4	0	0	0	0	0	75	06/15/8	30.0 13.2	
504107020106	A. HERSETUS	1	36	0	1	0	0	0	0	0	75	07/14/8	30.5 22.2	
504107020106	A. HERSETUS	2	55	45	2	0	0	0	0	0	75	06/28/8	30.4 16.2	
504107020106	A. HERSETUS	19	28	35	19	0	0	0	0	0	95	06/20/8	30.0 35.0	
504107020106	A. HERSETUS	104	31	51	104	0	0	0	0	0	95	07/05/8	33.0 16.0	
504107020106	A. HERSETUS	3	31	36	2	53	0	1	0	0	105	06/27/8	32.5 14.5	
504107020108	A. LYOLEPTIS	2	60	0	2	0	0	0	0	0	25	07/05/8	32.0 02.2	
504107020108	A. LYOLEPTIS	1	51	0	1	0	0	0	0	0	55	06/14/8	32.5 15.0	
504107020108	A. LYOLEPTIS	1	50	0	1	0	0	0	0	0	55	06/28/8	31.0 05.5	
504107020108	A. LYOLEPTIS	2	35	43	2	0	0	0	0	0	65	06/28/8	31.0 04.2	
504107020108	A. LYOLEPTIS	2	41	52	2	0	0	0	0	0	65	06/21/8	00.0 00.0	
504107020108	A. LYOLEPTIS	4	45	48	4	0	0	0	0	0	75	06/15/8	30.0 33.2	
504107020108	A. LYOLEPTIS	1	46	0	1	0	0	0	0	0	75	06/29/8	32.5 12.0	
504107020108	A. LYOLEPTIS	17	30	41	17	0	0	0	0	0	95	06/20/8	30.0 35.0	
504107020108	A. LYOLEPTIS	124	34	45	128	0	0	0	0	0	95	07/05/8	33.0 16.0	
504107020108	A. LYOLEPTIS	4	45	52	4	0	0	0	0	0	105	06/27/8	30.0 14.2	
504107020109	A. MITCHILLI	1	35	0	1	0	0	0	0	0	15	06/21/8	29.8 10.0	
504107020109	A. MITCHILLI	1	25	0	1	0	0	0	0	0	15	07/11/8	31.5 03.5	
504107020109	A. MITCHILLI	18	19	35	18	0	0	0	0	0	15	06/14/8	31.2 04.0	
504107020109	A. MITCHILLI	2	20	22	2	0	0	0	0	0	15	06/21/8	30.5 04.2	
504107020109	A. MITCHILLI	5	30	37	5	0	0	0	0	0	15	06/28/8	31.0 07.2	
504107020109	A. MITCHILLI	14	21	42	14	0	0	0	0	0	15	07/05/8	31.2 04.5	
504107020109	A. MITCHILLI	184	32	42	185	0	0	0	0	0	25	06/28/8	34.0 02.5	
504107020109	A. MITCHILLI	12	25	53	12	0	0	0	0	0	25	06/21/8	29.5 11.2	
504107020109	A. MITCHILLI	1	30	0	1	0	0	0	0	0	25	06/28/8	31.2 05.5	
504107020109	A. MITCHILLI	43	22	42	43	0	0	0	0	0	25	07/05/8	32.0 02.2	
504107020109	A. MITCHILLI	17	22	49	17	0	0	0	0	0	25	07/12/8	31.5 02.0	
504107020109	A. MITCHILLI	1707	17	38	1707	0	0	0	0	0	35	06/21/8	29.0 00.0	
504107020109	A. MITCHILLI	958	21	41	958	0	0	0	0	0	35	06/28/8	30.0 01.0	
504107020109	A. MITCHILLI	78	23	42	78	0	0	0	0	0	35	07/05/8	33.2 01.5	
504107020109	A. MITCHILLI	46	17	50	46	0	0	0	0	0	35	06/14/8	32.5 12.0	
504107020109	A. MITCHILLI	71	20	25	71	34	40	6	46	58	4	35	06/21/8	29.0 00.2
504107020109	A. MITCHILLI	6	23	42	6	0	0	0	0	0	35	06/28/8	30.5 02.0	
504107020109	A. MITCHILLI	5	25	39	5	0	0	0	0	0	35	07/05/8	33.0 01.5	
504107020109	A. MITCHILLI	108	30	41	108	0	0	0	0	0	35	07/12/8	31.2 00.5	
504107020109	A. MITCHILLI	1	20	0	1	0	0	0	0	0	45	06/21/8	24.5 02.2	
504107020109	A. MITCHILLI	41	14	14	28	29	40	13	0	0	45	06/28/8	30.2 02.2	

PAGE GENUS-SPECIE TAXON NUMBER	TOTAL IND.	PHYLOGENETIC SORT OF 2500+ FISH DATA BY TAXON, STATION, AND DATE.										NO. OF GENUS INITIAL AND SPECIES SPECIES NAME		
		SIZE CLASSI	NO. IND. CLASSI	SIZE CLASSI	NO. IND. CLASSI	STATION CLASSI	DATE CLASSI	TEMP NO. DAY	SAL TOP C	SAL TOP	ADDITIONAL			
508107020109	1	35	0	1	0	0	0	0	0	45	07/05/8	32.0 03.0	9 A.MITCHILLI	
508107020109	1	37	0	1	0	0	0	0	0	45	07/11/8	31.5 02.2	8 A.MITCHILLI	
508107020109	20	25	35	20	0	0	0	0	0	4T	06/14/8	32.0 14.0	8 A.MITCHILLI	
504107020109	44	22	44	44	0	0	0	0	0	4T	06/21/8	29.5 02.2	14 A.MITCHILLI	
508107020109	70	21	61	70	0	0	0	0	0	4T	06/28/8	30.0 02.0	14 A.MITCHILLI	
508107020109	315	22	53	315	0	0	0	0	0	4T	07/05/8	32.0 03.2	11 A.MITCHILLI	
508107020109	197	21	47	197	0	0	0	0	0	4T	07/12/8	31.2 00.5	9 A.MITCHILLI	
504107020109	34	30	40	34	0	0	0	0	0	5S	06/28/8	32.0 02.0	9 A.MITCHILLI	
508107020109	29	32	39	29	0	0	0	0	0	5S	07/05/8	32.0 02.8	12 A.MITCHILLI	
508107020109	5	31	37	5	0	0	0	0	0	5T	06/14/8	32.5 15.0	5 A.MITCHILLI	
504107020109	241	24	53	141	0	0	0	0	0	5T	06/21/8	30.0 08.0	9 A.MITCHILLI	
508107020109	64	25	51	64	0	0	0	0	0	5T	06/28/8	31.0 05.5	11 A.MITCHILLI	
508107020109	1144	22	70	1144	0	0	0	0	0	5T	07/05/8	32.2 00.0	13 A.MITCHILLI	
504107020109	472	21	52	472	0	0	0	0	0	5T	07/12/8	31.2 05.0	6 A.MITCHILLI	
508107020109	24	39	54	28	0	0	0	0	0	6S	06/14/8	32.5 25.0	6 A.MITCHILLI	
504107020109	284	27	47	284	0	0	0	0	0	6S	06/21/8	31.0 04.2	10 A.MITCHILLI	
508107020109	4	31	34	4	0	0	0	0	0	6S	07/05/8	32.5 04.2	9 A.MITCHILLI	
508107020109	21	30	55	23	0	0	0	0	0	6T	06/14/8	31.5 24.5	8 A.MITCHILLI	
508107020109	94	28	42	98	0	0	0	0	0	6T	06/21/8	30.0 00.0	11 A.MITCHILLI	
508107020109	145	26	59	146	0	0	0	0	0	6T	06/28/8	31.5 04.5	8 A.MITCHILLI	
508107020109	7	39	47	7	0	0	0	0	0	6T	07/05/8	31.0 05.5	7 A.MITCHILLI	
504107020109	4588	26	50	4588	0	0	0	0	0	7S	06/15/8	30.0 32.2	11 A.MITCHILLI	
508107020109	11	30	42	11	0	0	0	0	0	7S	07/04/8	32.0 11.0	11 A.MITCHILLI	
508107020109	-1	35	0	1	0	0	0	0	0	7S	07/14/8	30.5 22.2	18 A.MITCHILLI	
508107020109	2	40	45	2	0	0	0	0	0	7T	06/21/8	29.5 12.2	6 A.MITCHILLI	
508107020109	2	44	48	2	0	0	0	0	0	7T	07/04/8	30.2 08.0	4 A.MITCHILLI	
508107020109	1	32	0	1	0	0	0	0	0	7T	07/11/8	30.0 16.2	4 A.MITCHILLI	
508107020109	1	32	0	1	0	0	0	0	0	8S	06/15/8	32.5 33.0	10 A.MITCHILLI	
508107020109	7	33	42	7	0	0	0	0	0	9S	06/20/8	30.0 35.0	20 A.MITCHILLI	
508107020109	34	32	46	34	0	0	0	0	0	9S	06/29/8	32.5 14.5	13 A.MITCHILLI	
508107020109	344	26	46	344	0	0	0	0	0	9S	07/04/8	33.0 16.0	17 A.MITCHILLI	
508107020109	12	19	34	12	0	0	0	0	0	4S	07/12/8	31.0 15.5	18 A.MITCHILLI	
508107020109	14	14	23	14	0	0	0	0	0	10S	06/20/8	31.2 36.0	14 ANCHOA JUVS.	
508107020109	64	30	52	64	0	0	0	0	0	10S	06/27/8	32.5 14.5	20 A.MITCHILLI	
508107020109	4480	21	31	4480	0	0	0	0	0	10S	07/06/8	27.0 35.8	8 ANCHOA SP.	
508107020109	1	33	0	1	0	0	0	0	0	11S	06/15/8	32.5 08.0	6 A.MITCHILLI	
504107020109	4620	20	53	4520	0	0	0	0	0	11S	06/21/8	29.0 00.2	8 A.MITCHILLI	
508107020109	214	14	44	214	0	0	0	0	0	11S	06/28/8	30.5 02.2	11 A.MITCHILLI	
508107020109	121	21	36	121	0	0	0	0	0	11S	07/05/8	33.0 04.2	10 A.MITCHILLI	
509110020201	1	34	0	1	0	0	0	0	0	5T	06/28/8	31.0 05.5	11 S.FOFTENS	
508110020201	1	130	0	1	0	0	0	0	0	6T	06/14/8	31.5 24.5	8 S.FOFTENS	
508110020201	2	34	12	2	0	0	0	0	0	7S	06/29/8	32.5 12.0	15 S.FOFTENS	
504110020201	1	70	0	1	0	0	0	0	0	8S	06/29/8	34.5 25.5	15 S.FOFTENS	
504110020201	1	38	0	1	0	0	0	0	0	10S	06/27/8	30.0 15.2	20 S.FOFTENS	
508110020201	1	36	0	1	0	0	0	0	0	10S	07/06/8	27.0 35.8	8 S.FOFTENS	
508112010102	1	48	0	1	0	0	0	0	0	1T	07/12/8	30.5 02.0	9 T.CATUS	
508112010102	2	29	40	2	0	0	0	0	0	3S	06/28/8	30.0 01.0	10 T.CATUS	
508112010102	14	32	17	4	62	44	8	54	57	4T	06/21/8	29.0 00.2	16 T.CATUS	
508112010102	9	24	38	6	53	60	3	0	0	3T	06/28/8	30.5 02.0	7 T.CATUS	
508112010102	3	34	0	2	54	0	1	0	0	3T	07/12/8	31.2 00.5	11 T.CATUS	
508112010102	1	45	0	1	0	0	0	0	0	4T	06/28/8	30.0 02.0	16 T.CATUS	
508112010102	1	185	0	1	0	0	0	0	0	6T	07/12/8	31.0 04.0	4 T.CATUS	
508112030101	9	178	180	5	190	0	2	200	205	2	1T	06/14/8	31.2 06.0	8 A.FELIS
508112030101	36	28	41	31	230	240	4	290	0	1	1T	06/21/8	30.5 08.2	9 A.FELIS+FMR JUVS

PAGE 11	PHYLOGENETIC SORT OF 2500CS FISH DATA BY TAXON, STATION, AND DATE.												06/14/80			
	TAXON NUMBER	TOTAL	SET#	NO.IND	SIZE	NO.IND	SIZE	NO.IND	STATION	DATE	TEMP	SAL				
	IND	CLASSI	CLASSE	CLASSII	CLASSII	CLASSIII	CLASSIII	CLASSIII	NUMBER	M/D/YR	C TOP	S TOP	ROTTON			
SOH112030101	9	170190	5	230240	3	290	0	1	1T	06/29/80	31.0	03.2	14	A.FFLTS + EGGS		
SOH112030101	14	12 16	12	200240	2	0	0	0	1T	07/05/80	31.2	04.5	10	A.FFLTS + EGGS		
SOH112030101	1	245	0	1	260	0	2	0	0	0	2T	06/21/80	29.5	11.2	8	A.FFLTS
SOH112030101	2	240250	2	0	0	0	0	0	0	0	2T	06/28/80	31.2	05.5	10	A.FFLTS
SOH112030101	3	180140	2	240	0	1	0	0	0	0	3T	06/14/80	32.5	12.0	11	A.FFLTS
SOH112030101	1	180	0	1	0	0	0	0	0	0	3T	06/21/80	29.0	00.2	14	A.FFLTS
SOH112030101	2	170140	2	0	0	0	0	0	0	0	4T	06/14/80	32.0	14.0	8	A.FFLTS
SOH112030101	1	260	0	1	0	0	0	0	0	0	4T	06/21/80	29.5	02.2	14	A.FFLTS
SOH112030101	6	140	0	1	180190	2	200	0	1	4T	06/28/80	30.0	02.0	16	A.FFLTS	
SOH112030101	1	59	0	1	0	0	0	0	0	0	5S	07/05/80	32.0	02.0	12	A.FFLTS
SOH112030101	5	145160	2	170	0	1	173175	2	5T	06/14/80	32.5	15.0	5	A.FFLTS		
SOH112030101	7	120	0	2	215	0	1	0	0	0	5T	06/21/80	30.0	08.0	9	A.FFLTS
SOH112030101	5	58	0	1	190200	2	220210	2	5T	07/05/80	32.2	00.0	13	A.FFLTS		
SOH112030101	4	36	0	1	210220	2	250	0	1	5T	07/13/80	31.2	05.0	6	A.FFLTS	
SOH112030101	1	190	0	1	0	0	0	0	0	6T	06/28/80	31.5	04.5	8	A.FFLTS	
SOH112030101	17	5 10	16	250	0	3	0	0	0	6T	07/05/80	31.0	05.5	7	A.FFLTS + EGGS	
SOH112030101	150	14 39	143	145	0	1	240270	6	6T	07/13/80	31.0	05.5	4	A.FFLTS + EGGS		
SOH112030101	7	165175	2	260	0	1	0	0	0	7T	06/14/80	30.2	31.0	3	A.FFLTS	
SOH112030101	3	170	0	1	180185	2	0	0	0	7T	07/05/80	30.2	08.0	4	A.FFLTS	
SOH112030201	1	195	0	3	0	0	0	0	0	7T	06/14/80	32.5	12.0	11	R.MARINUS	
SOH112030201	7	72 79	3	0	0	0	0	0	0	7T	06/21/80	29.0	00.2	16	R.MARINUS	
SOH112030201	1	95	0	1	0	0	0	0	0	8T	07/12/80	31.2	00.5	11	R.MARINUS	
SOH112030201	1	82	0	1	0	0	0	0	0	8T	06/28/80	30.0	02.0	16	R.MARINUS	
SOH112030201	9	72 82	3	220	0	1	0	0	0	8T	06/28/80	31.0	05.5	11	R.MARINUS	
SOH112030201	9	170	0	2	0	0	0	230	0	1	8T	07/13/80	31.2	05.0	6	R.MARINUS
SOH112030201	1	155	0	1	0	0	0	0	0	8T	06/14/80	31.5	24.5	8	R.MARINUS	
SOH112030201	1	185	0	1	0	0	0	0	0	8T	06/21/80	00.0	00.0	11	R.MARINUS	
SOH112030201	9	140150	7	170180	2	0	0	0	0	8T	06/28/80	31.5	04.5	8	R.MARINUS	
SOH116020201	3	16 18	3	0	0	0	0	0	0	7S	06/15/80	30.0	32.2	11	R.HISTRIO	
SOH118020300	1	53	0	1	0	0	0	0	0	4S	06/29/80	32.5	14.5	13	STRONGYLURA SP.	
SOH118020302	1	48	0	1	0	0	0	0	0	1S	07/05/80	32.0	05.2	6	S.MARINA	
SOH118020302	1	47	0	1	0	0	0	0	0	3S	07/05/80	33.2	01.5	10	S.MARINA	
SOH118020302	1	67	0	1	0	0	0	0	0	4S	07/05/80	32.0	03.0	9	S.MARINA	
SOH118020302	1	110	0	1	0	0	0	0	0	4S	07/12/80	31.5	02.2	8	S.MARINA	
SOH118020302	2	90 92	2	0	0	0	0	0	0	4S	07/13/80	32.5	25.0	6	S.MARINA	
SOH118020302	2	90	0	1	0	0	0	0	0	4S	07/13/80	32.0	07.0	5	S.MARINA	
SOH118020302	1	75	0	1	0	0	0	0	0	4S	06/29/80	34.5	25.5	15	S.MARINA	
SOH118020302	1	85	0	1	0	0	0	0	0	4S	07/04/80	32.5	25.0	11	S.MARINA	
SOH118020302	3	35 37	2	75	0	1	0	0	0	4S	07/12/80	31.0	15.4	18	S.MARINA	
SOH118020302	1	103	0	1	0	0	0	0	0	10S	06/15/80	31.2	32.0	3	S.MARINA	
SOH118020302	2	43	0	1	93	0	1	0	0	10S	07/14/80	31.0	26.0	14	S.MARINA	
SOH118020302	1	40	0	1	0	0	0	0	0	11S	07/05/80	33.0	04.2	10	S.MARINA	
SOH118040607	4	40 42	2	44 50	2	0	0	0	0	9S	07/12/80	31.0	15.5	14	F.GRANDIS	
SOH118040607	1	24	0	1	0	0	0	0	0	10S	06/27/80	32.5	14.5	20	F.GRANDIS	
SOH118040902	1	18	0	1	0	0	0	0	0	4S	06/15/80	32.5	33.0	10	L.PARVA	
SOH118050201	2	13	0	2	0	0	0	0	0	10S	06/20/80	31.2	36.0	14	L.PARVA	
SOH118050201	1	25	0	1	0	0	0	0	0	3S	07/13/80	32.0	02.5	8	G.AFFINES	
SOH118040902	432	21 57	432	0	0	0	0	0	0	11S	07/05/80	33.0	04.2	10	G.AFFINES	
SOH118040802	69	24 48	69	0	0	0	0	0	0	15	06/21/80	29.0	10.0	9	M.BRYLLINA	
SOH118040802	287	20 47	287	0	0	0	0	0	0	15	06/28/80	33.5	02.2	4	M.BRYLLINA	
SOH118060802	140	21 44	140	0	0	0	0	0	0	15	07/05/80	32.0	05.2	6	M.BRYLLINA	
SOH118060802	160	15 44	160	0	0	0	0	0	0	15	07/13/80	31.5	03.5	3	M.BRYLLINA	
SOH118060802	171	23 48	171	0	0	0	0	0	0	2S	06/14/80	31.0	08.0	6	M.BRYLLINA	

PAGE GENUS-SPECIES TAXON NUMBER	TOTAL END	PHOENOTYPIC SORT OF 2500+ FISH DATA BY TAXON, STATION, AND DATE.											06/14/80 NO. OF GENUS INITIAL AND SPECIES NAME
		SIZE NO. IND. CLASSI	SIZE NO. IND. CLASSI	SIZE NO. IND. CLASSI	STATION NUMBER	DATE MO./DAY/YR	TEMP C	SAL PPM	SAL PPM	NO. DAY TOP C TOP	TOP C TOP	TOP C TOP	
SOA11060802	24	27 39	24	0 0	0	0 0	0	25	06/21/80	29.9	11.2		M. BERYLLINA
SOA11060802	15	12 0	1	21 38	14	0 0	0	25	06/28/80	34.0	02.5		M. BERYLLINA
SOA11060802	2	28 79	2	0 0	0	0 0	0	25	07/05/80	32.0	05.5		M. BERYLLINA
SOA11060802	75	9 0	1	19 40	75	0 0	0	25	07/17/80	32.5	02.2		M. BERYLLINA
SOA11060802	49	25 45	49	0 0	0	0 0	0	35	06/14/80	32.0	10.5		M. BERYLLINA
SOA11060802	5	23 0	1	31 42	4	0 0	0	35	06/21/80	29.0	06.2		M. BERYLLINA
SOA11060802	197	11 39	197	0 0	0	0 0	0	35	06/28/80	30.8	01.8		M. BERYLLINA
SOA11060802	134	12 52	138	0 0	0	0 0	0	35	07/05/80	33.2	01.5		M. BERYLLINA
SOA11060802	47	14 39	47	0 0	0	0 0	0	35	07/13/80	32.8	02.5		M. BERYLLINA
SOA11060802	221	14 50	221	0 0	0	0 0	0	45	06/28/80	30.2	02.2		M. BERYLLINA
SOA11060802	74	12 37	78	0 0	0	0 0	0	45	07/05/80	32.0	03.0		M. BERYLLINA
SOA11060802	49	20 43	49	0 0	0	0 0	0	45	07/17/80	31.5	02.2		M. BERYLLINA
SOA11060802	10	34 41	10	0 0	0	0 0	0	55	06/14/80	32.5	15.0		M. BERYLLINA
SOA11060802	1	35 0	1	0 0	0	0 0	0	55	06/21/80	30.2	11.0		M. BERYLLINA
SOA11060802	72	14 29	72	0 0	0	0 0	0	55	06/28/80	32.0	02.0		M. BERYLLINA
SOA11060802	31	25 39	31	0 0	0	0 0	0	55	07/05/80	32.8	02.8		M. BERYLLINA
SOA11060802	5	21 40	5	0 0	0	0 0	0	55	07/13/80	33.5	03.8		M. BERYLLINA
SOA11060802	29	21 28	29	0 0	0	0 0	0	65	06/28/80	31.0	04.2		M. BERYLLINA
SOA11060802	12	20 27	12	0 0	0	0 0	0	65	07/05/80	32.5	04.2		M. BERYLLINA
SOA11060802	2	25 27	2	0 0	0	0 0	0	75	06/29/80	32.5	12.0		M. BERYLLINA
SOA11060802	1	33 0	1	0 0	0	0 0	0	85	06/20/80	32.2	16.0		M. BERYLLINA
SOA11060802	295	24 44	295	0 0	0	0 0	0	85	06/29/80	34.5	25.5		M. BERYLLINA
SOA11060802	51	34 46	51	0 0	0	0 0	0	85	07/06/80	32.5	25.0		M. BERYLLINA
SOA11060802	84	20 50	85	0 0	0	0 0	0	85	07/14/80	31.8	28.2		M. BERYLLINA
SOA11060802	652	18 37	652	0 0	0	0 0	0	115	06/15/80	32.5	08.0		M. BERYLLINA
SOA11060802	13	24 40	13	0 0	0	0 0	0	115	06/21/80	29.0	00.2		M. BERYLLINA
SOA11060802	252	31 43	252	0 0	0	0 0	0	115	06/28/80	30.5	02.2		M. BERYLLINA
SOA11060802	450	12 41	450	0 0	0	0 0	0	115	07/05/80	33.8	04.2		M. BERYLLINA
SOA11060802	416	15 43	416	0 0	0	0 0	0	115	07/13/80	32.8	02.2		M. BERYLLINA
SOA122050600	1	55 0	1	0 0	0	0 0	0	55	07/12/80	33.5	01.8		SYNTHETUS SP.
SOA122050610	1	75 0	1	0 0	0	0 0	0	55	06/21/80	30.2	11.0		S. LOUISIANAF
SOA122050610	1	69 0	1	0 0	0	0 0	0	75	06/15/80	30.0	33.2		S. LOUISIANAF
SOA122050610	2	112 160	2	0 0	0	0 0	0	75	07/14/80	30.5	22.2		S. LOUISIANAF
SOA122050610	6	80 0	1	106 0	1	112 115	2	85	06/29/80	34.5	25.5		S. LOUISIANAF
SOA122050610	3	93 0	1	98 47	2	0 0	0	85	07/06/80	32.5	25.0		S. LOUISIANAF
SOA122050610	21	57 70	14	75 77	7	111 117	2	85	07/14/80	31.8	28.2		S. LOUISIANAF
SOA122050610	2	77 0	1	99 0	1	0 0	0	95	06/14/80	30.8	33.0		S. LOUISIANAF
SOA122050610	3	78 0	1	86 88	2	0 0	0	95	06/20/80	30.0	35.0		S. LOUISIANAF
SOA122050610	1	79 0	1	0 0	0	0 0	0	95	06/29/80	32.5	14.5		S. LOUISIANAF
SOA122050610	1	104 0	1	121 0	1	0 0	0	95	07/06/80	33.0	16.0		S. LOUISIANAF
SOA122050610	6	97 98	2	107 122	2	149 194	2	95	07/12/80	31.0	15.5		S. LOUISIANAF
SOA122050610	4	H2111	6	0 0	0	0 0	0	105	06/27/80	30.0	16.2		S. LOUISIANAF
SOA122050610	4	70 40	4	86 90	2	119 124	2	105	07/14/80	31.8	26.0		S. LOUISIANAF
SOA122050612	1	50 0	1	0 0	0	0 0	0	25	06/14/80	31.0	08.0		S. SCOVELLI
SOA122050612	3	54 0	1	0 0	0	0 0	0	25	06/21/80	29.9	11.2		S. SCOVELLI
SOA122050612	1	52 0	1	0 0	0	0 0	0	25	06/28/80	34.0	02.5		S. SCOVELLI
SOA122050612	1	47 0	1	0 0	0	0 0	0	55	06/14/80	32.5	15.0		S. SCOVELLI
SOA122050612	3	48 0	1	53 0	1	64 0	1	55	06/21/80	30.2	11.0		S. SCOVELLI
SOA122050612	5	46 80	5	0 0	0	0 0	0	55	07/05/80	32.8	02.8		S. SCOVELLI
SOA122050612	4	50 52	2	60 61	2	0 0	0	55	07/11/80	33.5	03.8		S. SCOVELLI
SOA122050612	1	49 0	1	0 0	0	0 0	0	65	07/05/80	32.5	04.2		S. SCOVELLI
SOA122050612	4	30 47	2	48 41	2	0 0	0	75	07/04/80	32.0	11.0		S. SCOVELLI
SOA122050612	5	36 43	3	54 0	1	64 0	1	75	07/14/80	30.5	22.2		S. SCOVELLI
SOA122050612	4	35 39	2	67 71	2	0 0	0	85	06/15/80	32.5	33.8		S. SCOVELLI

TAXON NUMBER	IND.	PHYSIOLOGIC SORT OF 2500CS FISH DATA BY TAXON, STATION, AND DATE.										NO. OF GENUS INITIAL AND SPECIES NAME	
		TOTAL SIZE	SIZE NO. IND.	SIZE NO. IND.	SIZE NO. IND.	STATION	DATE	TEMP	SAL	SAL	NO. DAY YR	TOP C TOP	
508122050612	1	45.0	1	0.0	0	0.0	0	85	06/20/8	32.2	36.0	9	<i>S. SCOVELL</i>
508122050612	4	41.50	2	64.0	7	74.94	3	85	06/20/8	34.5	29.5	15	<i>S. SCOVELL</i>
508122050612	14	45.52	10	67.77	7	85.97	2	85	07/06/8	32.5	25.0	11	<i>S. SCOVELL</i>
508122050612	13	37.47	4	54.70	6	75.83	3	85	07/14/8	31.8	28.2	14	<i>S. SCOVELL</i>
508122050612	4	58.80	2	70.72	2	0.0	0	95	06/16/8	30.8	31.0	18	<i>S. SCOVELL</i>
508122050612	2	51.74	2	0.0	0	0.0	0	95	06/20/8	30.0	35.0	20	<i>S. SCOVELL</i>
508122050612	1	51.0	1	69.81	2	0.0	0	95	07/06/8	33.0	16.0	17	<i>S. SCOVELL</i>
508122050612	5	42.0	1	58.0	1	65.71	3	95	07/12/8	31.0	25.5	18	<i>S. SCOVELL</i>
508122050612	4	66.0	2	49.0	1	75.0	1	105	06/20/8	31.2	36.0	14	<i>S. SCOVELL</i>
508122050612	10	43.57	6	60.90	4	0.0	0	105	06/27/8	30.0	16.2	20	<i>S. SCOVELL</i>
508122050612	11	34.42	3	51.67	8	0.0	0	105	07/06/8	27.0	35.8	8	<i>S. SCOVELL</i>
508122050612	10	35.48	2	48.69	3	72.80	5	105	07/14/8	31.8	26.0	14	<i>S. SCOVELL</i>
508123010103	5	270.96	2	300.0	2	350.0	1	1T	04/28/8	31.0	03.2	14	<i>C. PECTINATUS</i>
508123010103	2	240.95	2	0.0	0	0.0	0	1T	07/05/8	33.2	04.5	10	<i>C. PECTINATUS</i>
508123010103	3	300.10	3	0.0	0	0.0	0	1T	07/12/8	30.5	02.0	9	<i>C. PECTINATUS</i>
508123010104	5	245.60	2	340.90	2	450.0	1	1T	06/21/8	30.5	08.2	9	<i>C. UNDECIMALIS</i>
508123010104	2	240.0	1	360.0	1	0.0	0	1T	06/28/8	31.0	03.2	14	<i>C. UNDECIMALIS</i>
508123010104	3	360.0	1	540.0	1	660.0	1	1T	07/05/8	31.2	04.5	10	<i>C. UNDECIMALIS</i>
508123010104	2	491.14	2	0.0	0	0.0	0	35	06/28/8	30.0	01.8	10	<i>C. UNDECIMALIS</i>
508123010104	1	117.0	1	0.0	0	0.0	0	35	07/13/8	32.0	02.5	8	<i>C. UNDECIMALIS</i>
508123010104	1	210.0	1	260.0	1	500.0	1	3T	06/21/8	29.0	00.2	16	<i>C. UNDECIMALIS</i>
508123010104	1	260.0	1	0.0	0	0.0	0	3T	07/12/8	31.2	00.5	11	<i>C. UNDECIMALIS</i>
508123010104	1	290.0	1	0.0	0	0.0	0	4T	07/05/8	32.0	03.2	11	<i>C. UNDECIMALIS</i>
508123010104	1	270.0	1	0.0	0	0.0	0	4T	07/12/8	31.2	00.5	9	<i>C. UNDECIMALIS</i>
508123010104	1	340.0	1	0.0	0	0.0	0	4T	07/05/8	33.0	04.2	10	<i>C. UNDECIMALIS</i>
508123010104	2	110.15	2	0.0	0	0.0	0	115	06/21/8	29.0	00.2	8	<i>C. UNDECIMALIS</i>
508123010104	1	145.0	1	0.0	0	0.0	0	115	06/28/8	30.5	02.2	11	<i>C. UNDECIMALIS</i>
508123010104	1	130.0	1	0.0	0	0.0	0	115	07/05/8	33.0	04.2	10	<i>C. UNDECIMALIS</i>
508123010104	2	135.10	2	0.0	0	0.0	0	115	07/13/8	32.0	02.2	10	<i>C. UNDECIMALIS</i>
508123030000	1	24.0	1	8.0	0	0.0	0	115	07/13/8	32.0	02.2	6	<i>C. UNDECIMALIS</i>
508123050902	5	40.0	2	44.52	3	0.0	0	95	07/04/8	33.0	16.0	17	UNKNOWN SERPENT
508123050902	3	41.0	1	0.0	0	0.0	0	3T	06/21/8	29.0	00.2	16	<i>P. NIGROMACULATUS</i>
508123050902	1	41.0	1	0.0	0	0.0	0	4T	06/28/8	30.0	02.0	16	<i>P. NIGROMACULATUS</i>
508123130204	1	25.0	2	0.0	0	0.0	0	4T	07/12/8	31.2	00.5	9	<i>P. NIGROMACULATUS</i>
508123130204	1	32.0	1	0.0	0	0.0	0	2S	06/28/8	34.0	02.5	7	<i>C. HIPPUS</i>
508123130204	2	20.22	2	0.0	0	0.0	0	2T	06/21/8	29.5	11.2	8	<i>C. HIPPUS</i>
508123130204	2	34.18	2	0.0	0	0.0	0	2T	06/28/8	31.2	07.2	10	<i>C. HIPPUS</i>
508123130204	1	47.0	1	0.0	0	0.0	0	2T	07/05/8	32.0	07.2	10	<i>C. HIPPUS</i>
508123130204	2	32.64	2	0.0	0	0.0	0	4S	06/28/8	30.2	02.2	7	<i>C. HIPPUS</i>
508123130204	1	48.0	1	0.0	0	0.0	0	4S	07/05/8	32.0	03.0	9	<i>C. HIPPUS</i>
508123130204	1	34.0	1	0.0	0	0.0	0	4S	07/13/8	32.0	03.0	9	<i>C. HIPPUS</i>
508123130204	1	21.0	1	0.0	0	0.0	0	5S	06/28/8	32.0	02.0	9	<i>C. HIPPUS</i>
508123130204	1	37.0	1	0.0	0	0.0	0	5T	06/21/8	30.0	08.0	9	<i>C. HIPPUS</i>
508123130204	1	58.0	1	0.0	0	0.0	0	5T	07/05/8	32.2	00.0	13	<i>C. HIPPUS</i>
508123130204	4	43.26	4	0.0	0	0.0	0	6S	06/21/8	29.5	13.2	4	<i>C. HIPPUS</i>
508123130204	1	78.0	1	0.0	0	0.0	0	115	07/05/8	31.2	06.0	14	<i>C. HIPPUS</i>
508123130204	1	52.0	1	0.0	0	0.0	0	115	07/13/8	32.0	02.2	10	<i>C. HIPPUS</i>
508123130204	1	23.0	1	0.0	0	0.0	0	7T	06/21/8	29.0	12.2	6	<i>C. LATUUS</i>
508123130204	1	24.0	1	0.0	0	0.0	0	105	06/27/8	30.0	12.2	6	<i>C. LATUUS</i>
508123130301	2	52.55	2	0.0	0	0.0	0	6T	06/21/8	29.0	00.0	20	<i>C. CHRYSURUS</i>
508123130901	2	18.48	2	0.0	0	0.0	0	6T	06/28/8	31.5	04.5	8	<i>C. CHRYSURUS</i>
508123130901	2	29.46	2	0.0	0	0.0	0	1S	06/14/8	31.2	07.0	7	<i>O. SAURUS</i>
508123130901	5	43.46	2	51.53	2	54.50	2	1S	06/21/8	29.0	10.0	9	<i>O. SAURUS</i>
508123130901	5	20.24	3	44.0	1	48.0	1	2S	06/21/8	29.0	11.2	8	<i>O. SAURUS</i>

TAXON NUMBER	PAGE /	PHYLOGENETIC SORT OF 2500CES FISH DATA BY TAXON, STATION, AND DATE.											NO. OF GENUS INITIAL AND SPECIES SPECIES NAME	04/14/90		
		TOTAL IND.	SIZE CLASSI	NO. IND.	SIZE CLASSI	NO. IND.	SIZE CLASSI	NO. IND.	STATION NUMBER	DATE MO/DAY/YR	TEMP C	SAL TOP	SAL BOT			
508123130901	1	95	0	1	0	0	0	0	PS	07/13/8	32.5	02.2		5	D. SAURUS	
508123130901	1	19	0	1	0	0	0	0	AS	06/14/8	32.5	13.0		2	D. SAURUS	
508123130901	3	61	0	1	70	0	1	85	0	1	45	06/21/8	29.5	02.2	6	D. SAURUS
508123130901	3	41	0	1	61	63	2	0	0	0	45	07/05/8	32.0	03.0	9	D. SAURUS
508123130901	2	54	0	1	71	0	1	80	0	0	55	06/21/8	30.2	11.0	10	D. SAURUS
508123130901	1	22	0	1	0	0	0	0	0	55	06/28/8	32.0	02.0	9	D. SAURUS	
508123130901	1	12	0	1	0	0	0	0	0	45	06/28/8	31.0	04.2	10	D. SAURUS	
508123130901	1	27	0	1	0	0	0	0	0	45	07/17/8	32.0	07.0	5	D. SAURUS	
508123130901	1	29	0	1	0	0	0	0	0	45	06/16/8	30.0	13.0	18	D. SAURUS	
508123130901	3	22	0	1	24	30	2	0	0	0	45	06/20/8	30.0	05.0	20	D. SAURUS
508123130901	2	70	0	2	10	0	0	0	0	115	07/13/8	32.0	02.2	6	D. SAURUS	
508123131101	1	125	0	1	0	0	0	0	0	7T	07/17/8	30.0	16.0	4	S. VOMER	
508123131302	1	15	0	1	0	0	0	0	0	15	06/14/8	31.2	07.0	7	T. FALCATUS	
508123131302	1	32	0	1	0	0	0	0	0	15	06/21/8	29.0	10.0	9	T. FALCATUS	
508123131302	1	21	0	1	0	0	0	0	0	55	06/14/8	32.0	05.0	10	T. FALCATUS	
508123131302	1	25	0	1	0	0	0	0	0	55	07/05/8	32.0	02.0	12	T. FALCATUS	
508123131302	1	35	0	1	0	0	0	0	0	55	07/13/8	33.5	03.0	6	T. FALCATUS	
508123131302	14	23	0	1	30	37	13	0	0	0	45	06/14/8	32.5	25.0	6	T. FALCATUS
508123131302	2	43	0	1	60	0	1	0	0	0	45	06/21/8	29.5	13.0	4	T. FALCATUS
508123131302	10	30	32	6	15	38	2	41	44	2	45	07/05/8	32.5	04.0	9	T. FALCATUS
508123131302	2	32	45	2	0	0	0	0	0	45	07/17/8	32.0	07.0	5	T. FALCATUS	
508123131302	3	40	0	1	49	0	1	52	0	1	7S	06/20/8	30.5	34.0	11	T. FALCATUS
508123131302	2	36	37	2	0	0	0	0	0	7S	06/29/8	32.5	12.0	15	T. FALCATUS	
508123131302	2	21	22	2	0	0	0	0	0	45	06/28/8	34.5	25.5	19	T. FALCATUS	
508123170304	2	185	10	2	0	0	0	0	0	2T	06/14/8	30.0	07.0	4	L. GRISFUS	
508123170306	1	170	0	1	0	0	0	0	0	2T	06/28/8	31.2	05.0	10	L. GRISFUS	
508123170306	1	140	0	1	0	0	0	0	0	2T	07/05/8	32.0	02.0	8	L. GRISFUS	
508123170306	1	85	0	1	0	0	0	0	0	3S	07/17/8	32.0	02.0	8	L. GRISFUS	
508123170306	3	14	0	1	21	20	2	0	0	0	4T	06/14/8	32.0	14.0	8	L. GRISFUS
508123170306	1	70	0	1	0	0	0	0	0	4T	06/28/8	30.0	02.0	16	L. GRISFUS	
508123170306	1	110	0	1	0	0	0	0	0	4S	07/05/8	32.5	04.0	9	L. GRISFUS	
508123170306	8	11	18	6	25	32	2	0	0	0	7S	06/24/8	32.5	12.0	15	L. GRISFUS
508123170306	6	16	17	2	20	22	2	26	34	2	7S	07/04/8	32.0	11.0	11	L. GRISFUS
508123170306	24	11	17	3	21	32	22	46	0	1	7S	07/14/8	30.5	22.0	18	L. GRISFUS
508123170306	1	12	0	1	0	0	0	0	0	45	06/29/8	34.5	25.5	15	L. GRISFUS	
508123170306	1	21	0	1	0	0	0	0	0	45	06/20/8	30.0	35.0	20	L. GRISFUS	
508123170306	1	15	0	1	0	0	0	0	0	45	06/29/8	32.5	14.5	13	L. GRISFUS	
508123170306	1	45	0	1	0	0	0	0	0	115	06/15/8	32.5	04.0	6	L. GRISFUS	
508123170306	1	35	0	1	0	0	0	0	0	7S	06/20/8	30.5	34.0	11	L. MAHOGONI	
508123170306	1	28	0	1	0	0	0	0	0	95	07/04/8	33.0	16.0	17	L. MAHOGONI	
508123170309	4	15	20	4	0	0	0	0	0	7S	06/29/8	32.5	12.0	15	L. SYNAGRIS	
508123170309	4	20	0	1	24	26	2	40	0	1	7S	07/04/8	32.0	11.0	11	L. SYNAGRIS
508123170304	4	14	19	4	25	26	2	0	0	0	7S	07/14/8	30.5	22.0	18	L. SYNAGRIS
508123170304	1	34	0	1	0	0	0	0	0	95	07/12/8	31.0	15.0	18	L. SYNAGRIS	
508123170304	1	20	0	1	0	0	0	0	0	105	06/27/8	30.0	16.0	20	L. SYNAGRIS	
508123170304	4	13	0	2	14	17	3	0	0	0	105	07/14/8	31.0	26.0	14	L. SYNAGRIS
508123190101	12	22	37	32	9	0	0	0	0	0	15	06/14/8	31.2	07.0	7	D. OLEISTHOSTOMUS
508123190101	1	29	0	1	0	0	0	0	0	15	06/21/8	29.0	10.0	9	D. OLEISTHOSTOMUS	
508123190101	14	34	47	14	0	0	0	0	0	0	15	06/28/8	33.5	02.0	4	D. OLEISTHOSTOMUS
508123190101	7	36	54	7	0	0	0	0	0	0	15	07/05/8	32.0	05.0	6	D. OLEISTHOSTOMUS
508123190101	3	31	34	3	0	0	0	0	0	0	17	06/14/8	31.2	04.0	8	D. OLEISTHOSTOMUS
508123190101	1	30	0	1	0	0	0	0	0	0	17	06/21/8	30.5	08.0	9	D. OLEISTHOSTOMUS
508123190101	3	25	40	9	0	0	0	0	0	0	17	06/28/8	31.0	03.0	14	D. OLEISTHOSTOMUS
508123190101	5	36	42	5	0	0	0	0	0	0	17	07/05/8	31.2	04.0	10	D. OLEISTHOSTOMUS

SPECIES	GENUS+SPECIES	TOTAL	PHYLOGENETIC SORT OF 2500CFS FISH DATA BY TAXON, STATION, AND DATE.										NO. OF GENUS INITIAL AND SPECIES NAME	04/14/90			
			TAXON NUMBER	TND	CLASSI	CLASSII	CLASSIII	CLASSIV	CLASSV	CLASSVI	STATION	DATE	TEMP	SAL	SAL		
					NO. IND	SIZE	NO. IND	SIZE	NO. IND	SIZE	NO. IND	MO./DAY	YR	TOP C	TOP	BOTTOM	
SOA123190101		2	35	0	2	0	0	0	0	0	25	06/21/8	29.9	11.2	A	POLISTHOSTOMUS	
SOA123190101		1	32	0	1	0	0	0	0	0	25	06/20/8	34.0	02.5	7	POLISTHOSTOMUS	
SOA123190101		28	18	22	4	25	33	24	0	0	27	06/14/8	30.8	07.6	4	POLISTHOSTOMUS	
SOA123190101		10	25	36	10	0	0	0	0	0	27	06/28/8	31.2	05.5	10	POLISTHOSTOMUS	
SOA123190101		3	17	21	3	0	0	0	0	0	27	07/05/8	32.0	02.2	8	POLISTHOSTOMUS	
SOA123190101		4	25	31	7	42	52	2	0	0	27	07/12/8	31.8	02.0	6	POLISTHOSTOMUS	
SOA123190101		2	48	50	2	0	0	0	0	0	35	06/28/8	30.8	01.8	10	POLISTHOSTOMUS	
SOA123190101		1	39	0	1	0	0	0	0	0	35	07/19/8	32.8	02.5	8	POLISTHOSTOMUS	
SOA123190101		2	45	0	1	85	0	1	0	0	37	07/05/8	33.8	01.5	5	POLISTHOSTOMUS	
SOA123190101		12	21	24	6	34	35	2	40	54	4	37	07/12/8	31.2	00.5	11	POLISTHOSTOMUS
SOA123190101		1	37	0	1	0	0	0	0	0	45	06/21/8	29.5	02.2	6	POLISTHOSTOMUS	
SOA123190101		4	24	36	6	0	0	0	0	0	45	06/28/8	30.2	02.2	7	POLISTHOSTOMUS	
SOA123190101		3	38	39	2	43	0	1	0	0	45	07/05/8	32.0	03.0	9	POLISTHOSTOMUS	
SOA123190101		1	100	0	1	0	0	0	0	0	47	06/14/8	32.0	14.0	8	POLISTHOSTOMUS	
SOA123190101		1	26	0	1	0	0	0	0	0	47	06/21/8	29.5	02.2	14	POLISTHOSTOMUS	
SOA123190101		13	15	19	4	34	36	2	40	45	7	47	07/05/8	32.0	03.2	11	POLISTHOSTOMUS
SOA123190101		51	21	27	34	17	47	15	88	0	1	47	07/12/8	31.2	00.5	9	POLISTHOSTOMUS
SOA123190101		1	27	31	2	38	0	1	0	0	57	06/28/8	31.0	05.5	11	POLISTHOSTOMUS	
SOA123190101		2	18	21	2	0	0	0	0	0	57	07/05/8	32.2	00.0	13	POLISTHOSTOMUS	
SOA123190101		1	24	0	1	27	0	2	0	0	57	07/13/8	31.2	05.0	6	POLISTHOSTOMUS	
SOA123190101		4	25	37	4	0	0	0	0	0	65	06/28/8	31.0	04.2	10	POLISTHOSTOMUS	
SOA123190101		1	18	0	1	0	0	0	0	0	47	07/05/8	31.0	05.5	7	POLISTHOSTOMUS	
SOA123190101		1	18	0	1	0	0	0	0	0	45	07/06/8	32.5	25.0	11	POLISTHOSTOMUS	
SOA123190101		3	32	34	3	0	0	0	0	0	45	07/06/8	32.0	16.0	12	POLISTHOSTOMUS	
SOA123190101		1	25	0	1	0	0	0	0	0	105	06/27/8	32.5	16.5	20	POLISTHOSTOMUS	
SOA123190101		56	15	74	56	0	0	0	0	0	115	06/15/8	32.5	08.0	6	POLISTHOSTOMUS	
SOA123190101		1	30	0	1	0	0	0	0	0	115	06/21/8	29.0	00.2	8	POLISTHOSTOMUS	
SOA123190101		2	26	34	2	0	0	0	0	0	115	06/28/8	30.5	02.2	11	POLISTHOSTOMUS	
SOA123190102		5	39	51	5	0	0	0	0	0	15	07/05/8	32.0	05.2	6	PLUMIFERI	
SOA123190102		1	23	0	1	0	0	0	0	0	17	06/14/8	31.2	06.0	8	PLUMIFERI	
SOA123190102		2	26	0	1	284	0	1	0	0	17	06/21/8	30.5	08.2	9	PLUMIFERI	
SOA123190102		12	13	0	1	240	240	9	310	0	2	17	06/28/8	31.0	03.2	14	PLUMIFERI
SOA123190102		2	210	50	2	0	0	0	0	0	17	07/05/8	31.2	04.5	10	PLUMIFERI	
SOA123190102		3	220	50	2	270	0	1	0	0	17	07/12/8	30.5	02.0	9	PLUMIFERI	
SOA123190102		1	51	0	1	0	0	0	0	0	35	07/05/8	33.2	01.5	10	PLUMIFERI	
SOA123190102		4	105	0	1	120	140	2	180	0	1	37	06/21/8	29.0	00.2	16	PLUMIFERI
SOA123190102		1	260	0	1	0	0	0	0	0	37	06/28/8	30.5	02.0	7	PLUMIFERI	
SOA123190102		3	49	0	1	121	123	2	0	0	0	17	07/05/8	33.8	01.5	5	PLUMIFERI
SOA123190102		36	34	45	11	44	56	18	150	0	1	47	07/12/8	31.2	00.5	9	PLUMIFERI
SOA123190200		145	19	44	145	0	0	0	0	0	15	06/14/8	31.2	07.8	7	FUCINOSTOMUS SP	
SOA123190200		14	27	30	14	0	0	0	0	0	15	06/21/8	29.8	10.0	9	FUCINOSTOMUS SP	
SOA123190200		51	25	31	53	0	0	0	0	0	15	07/05/8	32.0	05.2	6	FUCINOSTOMUS SP	
SOA123190200		3	30	0	1	0	0	0	0	0	17	06/14/8	31.2	06.0	8	FUCINOSTOMUS SP	
SOA123190200		1	28	0	1	0	0	0	0	0	25	07/11/8	32.5	02.2	5	FUCINOSTOMUS SP	
SOA123190200		390	24	48	248	0	0	0	0	0	27	06/14/8	30.8	07.6	4	FUCINOSTOMUS SP	
SOA123190200		12	25	30	12	0	0	0	0	0	27	06/21/8	29.5	11.2	8	FUCINOSTOMUS SP	
SOA123190200		6	19	24	5	0	0	0	0	0	27	06/28/8	31.2	05.5	10	FUCINOSTOMUS SP	
SOA123190200		3	23	30	3	0	0	0	0	0	27	07/05/8	32.0	02.2	8	FUCINOSTOMUS SP	
SOA123190200		4	26	28	4	0	0	0	0	0	27	07/12/8	31.5	02.0	4	FUCINOSTOMUS SP	
SOA123190200		4	11	12	4	0	0	0	0	0	35	06/21/8	29.0	00.2	6	FUCINOSTOMUS SP	
SOA123190200		3	14	19	3	0	0	0	0	0	35	06/28/8	30.8	01.8	10	FUCINOSTOMUS SP	
SOA123190200		7	29	30	7	0	0	0	0	0	35	07/05/8	33.2	01.5	10	FUCINOSTOMUS SP	
SOA123190200		1	31	0	1	0	0	0	0	0	37	07/12/8	31.2	00.5	11	FUCINOSTOMUS SP	
SOA123190200		9	23	26	2	0	0	0	0	0	45	06/24/8	30.2	02.2	7	FUCINOSTOMUS SP	

PAGE	GENUS-SPECIES	PHYLICOGENETIC SORT OF 25000ES FISH DATA BY TAXON, STATION, AND DATE										NO. OF GENUS INITIAL AND SPECIES NAME	04/14/84	
		TOTAL	SEX	NO.IND.	SIZE	NO.IND.	SIZE	NO.IND.	STATION	DATE	TEMP	SAL	SAL	
TAXON NUMBER	TAXON	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	MONTH	YR	C	TOP	ADDITIONAL SPECIES NAME
TAXON NUMBER	TAXON	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	MONTH	YR	C	TOP	ADDITIONAL SPECIES NAME
508123190200	E. 28.32	13	0	0	0	0	0	0	4T	06/14/84	32.0	14.0	8	EUCINOSTOMUS SP
508123190200	E. 15.24	3	0	0	0	0	0	0	4T	06/21/84	29.5	02.2	14	EUCINOSTOMUS SP
508123190200	E. 14.28	17	0	0	0	0	0	0	4T	06/28/84	30.0	02.0	16	EUCINOSTOMUS SP
508123190200	E. 22.26	2	0	0	0	0	0	0	4T	07/05/84	32.0	03.2	11	EUCINOSTOMUS SP
508123190200	E. 24.30	12	0	0	0	0	0	0	4T	07/12/84	31.2	00.5	9	EUCINOSTOMUS SP
508123190200	E. 21.30	4	0	0	0	0	0	0	5S	07/13/84	31.5	01.8	6	EUCINOSTOMUS SP
508123190200	E. 27.30	35	0	0	0	0	0	0	5T	06/14/84	32.5	15.0	5	EUCINOSTOMUS SP
508123190200	E. 25.30	70	0	0	0	0	0	0	5T	06/21/84	30.0	08.0	9	EUCINOSTOMUS SP
508123190200	E. 14.28	12	0	0	0	0	0	0	5T	06/28/84	31.0	05.5	11	EUCINOSTOMUS SP
508123190200	E. 26.35	23	0	0	0	0	0	0	6S	06/14/84	32.5	25.0	6	EUCINOSTOMUS SP
508123190200	E. 10.29	223	0	0	0	0	0	0	6S	06/28/84	31.0	04.2	10	EUCINOSTOMUS SP
508123190200	E. 30.32	6	0	0	0	0	0	0	6T	06/14/84	31.5	24.5	8	EUCINOSTOMUS SP
508123190200	E. 12.30	30	0	0	0	0	0	0	7S	06/20/84	30.5	34.0	11	EUCINOSTOMUS SP
508123190200	E. 10.27	18	0	0	0	0	0	0	7S	06/28/84	32.5	12.0	15	EUCINOSTOMUS SP
508123190200	E. 17.20	7	0	0	0	0	0	0	7S	07/05/84	32.0	11.0	11	EUCINOSTOMUS SP
508123190200	E. 8.30	30	0	0	0	0	0	0	7S	07/14/84	30.5	22.2	18	EUCINOSTOMUS SP
508123190200	E. 18.30	162	0	0	0	0	0	0	7T	06/21/84	29.6	12.2	6	EUCINOSTOMUS SP
508123190200	E. 19.31	202	0	0	0	0	0	0	7T	06/28/84	30.0	16.2	5	EUCINOSTOMUS SP
508123190200	E. 24.31	14	0	0	0	0	0	0	7T	07/05/84	30.2	08.0	4	EUCINOSTOMUS SP
508123190200	E. 23.30	10	0	0	0	0	0	0	8S	06/15/84	32.5	33.0	10	EUCINOSTOMUS SP
508123190200	E. 17.30	47	0	0	0	0	0	0	8S	06/28/84	32.0	08.0	9	EUCINOSTOMUS SP
508123190200	E. 22.30	37	0	0	0	0	0	0	8S	06/29/84	34.5	25.5	15	EUCINOSTOMUS SP
508123190200	E. 10.0	1	0	0	0	0	0	0	8S	07/04/84	32.5	25.0	11	EUCINOSTOMUS SP
508123190200	E. 10.0	1	24.33	26	0	0	0	0	9S	06/14/84	30.0	33.0	18	EUCINOSTOMUS SP
508123190200	E. 9.24	32	0	0	0	0	0	0	9S	06/20/84	30.0	35.0	20	EUCINOSTOMUS SP
508123190200	E. 7.0	2	0	0	0	0	0	0	9S	06/29/84	32.5	14.5	13	EUCINOSTOMUS SP
508123190200	E. 7.13	3	18.28	14	0	0	0	0	9S	07/04/84	33.0	16.0	17	EUCINOSTOMUS SP
508123190200	E. 9.11	2	0	0	0	0	0	0	9S	07/12/84	31.0	15.5	18	EUCINOSTOMUS SP
508123190200	E. 9.30	31	0	0	0	0	0	0	10S	06/15/84	31.2	32.0	3	EUCINOSTOMUS SP
508123190200	E. 7.15	241	0	0	0	0	0	0	10S	06/20/84	31.2	36.0	14	EUCINOSTOMUS SP
508123190200	E. 9.10	2	13.26	2	0	0	0	0	10S	06/27/84	30.0	16.2	20	EUCINOSTOMUS SP
508123190200	E. 11.28	209	0	0	0	0	0	0	10S	07/04/84	27.0	35.0	4	EUCINOSTOMUS SP
508123190200	E. 15.33	33	0	0	0	0	0	0	11S	06/15/84	32.5	08.0	6	EUCINOSTOMUS SP
508123190200	E. 14.0	1	0	0	0	0	0	0	11S	06/21/84	29.0	00.2	9	EUCINOSTOMUS SP
508123190200	E. 10.16	4	0	0	0	0	0	0	11S	06/28/84	30.5	02.2	11	EUCINOSTOMUS SP
508123190200	E. 12.0	1	0	0	0	0	0	0	11S	07/05/84	33.0	04.2	10	EUCINOSTOMUS SP
508123190201	E. 31.48	47	0	0	0	0	0	0	1T	06/21/84	29.0	10.0	9	E ARGENTEUS
508123190201	E. 28.49	8	0	0	0	0	0	0	1T	06/28/84	33.5	02.2	4	E ARGENTEUS
508123190201	E. 36.46	39	0	0	0	0	0	0	1T	07/04/84	32.0	05.2	6	E ARGENTEUS
508123190201	E. 75.7H	2	0	0	0	0	0	0	1T	06/14/84	31.2	06.0	8	E ARGENTEUS
508123190201	E. 45.55	2	110.0	1	210.0	0	1	1T	06/28/84	31.0	03.2	14	E ARGENTEUS	
508123190201	E. 28.40	12	46.40	2	66.76	0	2	2S	06/14/84	31.0	08.0	6	E ARGENTEUS	
508123190201	E. 31.44	13	95.57	2	0	0	0	2S	06/21/84	29.0	11.2	8	E ARGENTEUS	
508123190201	E. 37.55	21	0	0	0	0	0	2S	06/28/84	34.0	02.5	7	E ARGENTEUS	
508123190201	E. 48.62	14	0	0	0	0	0	2S	07/05/84	32.0	05.5	3	E ARGENTEUS	
508123190201	E. 51.63	14	0	0	0	0	0	2S	07/17/84	32.5	02.2	5	E ARGENTEUS	
508123190201	E. 32.45	6	0	0	0	0	0	2T	06/21/84	29.5	11.2	8	E ARGENTEUS	
508123190201	E. 43.50	2	0	0	0	0	0	2T	07/05/84	32.0	02.2	8	E ARGENTEUS	
508123190201	E. 32.40	4	45.55	4	0	0	0	2T	07/12/84	31.5	02.0	4	E ARGENTEUS	
508123190201	E. 32.35	2	0	0	0	0	0	3S	06/14/84	32.0	10.5	5	E ARGENTEUS	
508123190201	E. 31.52	7	0	0	0	0	0	3S	06/21/84	29.0	00.2	6	E ARGENTEUS	
508123190201	E. 20.35	2	0	0	0	0	0	3S	06/28/84	30.0	01.0	10	E ARGENTEUS	
508123190201	E. 33.0	1	0	0	0	0	0	3T	06/14/84	32.5	12.0	11	E ARGENTEUS	
508123190201	E. 34.51	8	0	0	0	0	0	4S	06/14/84	32.5	13.0	2	E ARGENTEUS	

PHYLOGENETIC SORT OF 2500CS FISH DATA BY TAXON, STATION, AND DATE.												06/14/80	
GENUS-SPECIES	TOTAL	SIZE	NO.IND.	SIZE	NO.IND.	SIZE	NO.IND.	STATION	DATE	TEMP	SAL	HAB	NO. OF GENUS INITIAL AND SPECIES SPECIES NAME
TAXON NUMBER	TND	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	NUMBER	MO DAY	HR	C TOP	BOTTOM
504123190201	4	48.50	2	50.50	6	67.0	1	45	06/21/80	29.5	02.2	A	F. ARGENTEURIS
504123190201	2	47.54	2	50.00	0	0.0	0	45	06/21/80	30.2	02.2	7	F. ARGENTEURIS
504123190201	17	36.48	17	0.0	0	0.0	0	45	07/05/80	32.0	03.0	9	F. ARGENTEURIS
504123190201	4	24.24	2	24.36	2	0.0	0	45	07/13/80	31.5	02.2	8	F. ARGENTEURIS
504123190201	1	78.0	1	0.0	0	0.0	0	47	06/14/80	32.0	14.0	8	F. ARGENTEURIS
504123190201	5	30.39	5	0.0	0	0.0	0	47	06/21/80	29.5	02.2	14	F. ARGENTEURIS
504123190201	1	38.0	1	0.0	0	0.0	0	47	06/28/80	30.8	02.0	16	F. ARGENTEURIS
504123190201	12	34.42	9	44.0	1	40.94	1	55	06/14/80	32.5	15.0	10	F. ARGENTEURIS
504123190201	10	31.45	10	0.0	0	0.0	0	55	06/21/80	30.2	11.0	10	F. ARGENTEURIS
504123190201	22	12.52	22	0.0	0	0.0	0	55	06/28/80	32.0	02.0	9	F. ARGENTEURIS
504123190201	2	49.50	2	0.0	0	0.0	0	55	07/05/80	32.8	02.8	12	F. ARGENTEURIS
504123190201	1	50.0	1	0.0	0	0.0	0	55	07/13/80	31.5	03.8	6	F. ARGENTEURIS
504123190201	19	33.49	19	0.0	0	0.0	0	57	06/14/80	32.5	15.0	5	F. ARGENTEURIS
504123190201	4	35.38	2	45.0	1	87.0	1	57	06/21/80	30.0	04.0	9	F. ARGENTEURIS
504123190201	79	12.45	78	65.0	1	0.0	0	57	06/28/80	31.0	05.5	11	F. ARGENTEURIS
504123190201	4	38.0	2	44.0	1	52.0	1	57	07/05/80	32.2	00.0	13	F. ARGENTEURIS
504123190201	5	55.78	5	0.0	0	0.0	0	65	06/14/80	32.5	25.0	6	F. ARGENTEURIS
504123190201	3	37.39	2	60.0	1	0.0	0	65	06/21/80	29.5	13.0	4	F. ARGENTEURIS
504123190201	41	31.47	41	0.0	0	0.0	0	65	06/28/80	31.0	04.0	10	F. ARGENTEURIS
504123190201	3	38.43	2	65.0	1	0.0	0	65	07/05/80	32.5	04.0	9	F. ARGENTEURIS
504123190201	1	87.0	1	0.0	0	0.0	0	65	07/13/80	32.8	07.0	5	F. ARGENTEURIS
504123190201	8	49.55	2	70.0	1	88100	4	67	06/14/80	31.5	24.5	8	F. ARGENTEURIS
504123190201	19	33.39	9	55.75	10	0.0	0	67	06/21/80	00.0	00.0	11	F. ARGENTEURIS
504123190201	2	44.42	2	0.0	0	0.0	0	67	07/05/80	31.0	05.5	7	F. ARGENTEURIS
504123190201	12	24.15	12	0.0	0	0.0	0	75	04/15/80	10.0	32.0	11	F. ARGENTEURIS
504123190201	1	44.0	1	0.0	0	0.0	0	75	06/20/80	30.5	34.0	11	F. ARGENTEURIS
504123190201	26	30.40	26	0.0	0	0.0	0	75	06/29/80	32.5	12.0	16	F. ARGENTEURIS
504123190201	0	24.27	4	34.36	3	45.0	1	75	07/06/80	32.0	11.0	11	F. ARGENTEURIS
504123190201	16	31.40	16	0.0	0	0.0	0	75	07/14/80	30.5	22.0	18	F. ARGENTEURIS
504123190201	1	41.0	1	0.0	0	0.0	0	77	06/14/80	30.2	11.0	3	F. ARGENTEURIS
504123190201	174	31.60	174	0.0	0	0.0	0	77	06/21/80	29.6	12.0	6	F. ARGENTEURIS
504123190201	17	34.0	1	41.47	6	55.70	11	77	06/28/80	30.8	16.2	5	F. ARGENTEURIS
504123190201	9	35.38	5	52.51	2	45.91	2	77	07/05/80	30.2	08.0	4	F. ARGENTEURIS
504123190201	1	68.0	1	0.0	0	0.0	0	77	07/13/80	30.8	16.2	4	F. ARGENTEURIS
504123190201	49	13.75	40	0.0	0	0.0	0	85	06/20/80	32.2	36.0	9	F. ARGENTEURIS
504123190201	28	31.39	28	0.0	0	0.0	0	85	06/29/80	34.5	25.5	15	F. ARGENTEURIS
504123190201	14	21.41	14	0.0	0	0.0	0	85	07/06/80	32.5	25.0	11	F. ARGENTEURIS
504123190201	5	30.40	5	0.0	0	0.0	0	85	07/14/80	31.8	28.2	14	F. ARGENTEURIS
504123190201	14	30.54	14	0.0	0	0.0	0	95	06/20/80	30.0	35.0	20	F. ARGENTEURIS
504123190201	12	28.36	12	0.0	0	0.0	0	95	06/29/80	32.5	14.5	13	F. ARGENTEURIS
504123190201	20	31.47	14	58.0	1	0.0	0	95	07/06/80	33.0	16.0	17	F. ARGENTEURIS
504123190201	12	37.64	10	52.65	2	0.0	0	95	07/13/80	31.0	15.5	18	F. ARGENTEURIS
504123190201	12	35.03	12	0.0	0	0.0	0	105	06/15/80	31.2	32.0	2	F. ARGENTEURIS
504123190201	1	36.0	1	0.0	0	0.0	0	105	06/20/80	31.2	36.0	16	F. ARGENTEURIS
504123190201	26	28.35	17	45.48	9	0.0	0	105	06/27/80	30.0	15.2	20	F. ARGENTEURIS
504123190201	21	30.32	2	35.53	9	0.0	0	105	07/06/80	27.0	35.0	8	F. ARGENTEURIS
504123190201	22	35.34	7	43.47	10	53.87	5	105	07/14/80	31.0	26.0	14	F. ARGENTEURIS
504123190201	3	36.52	3	0.0	0	0.0	0	115	07/13/80	32.8	07.2	6	F. ARGENTEURIS
504123190201	1	72.0	1	0.0	0	0.0	0	115	06/14/80	31.2	07.0	7	F. GILA
504123190201	37	31.48	19	0.0	0	0.0	0	115	06/21/80	29.8	10.0	9	F. GILA
504123190201	25	34.54	25	0.0	0	0.0	0	115	06/28/80	33.5	02.2	4	F. GILA
504123190201	7	37.58	7	0.0	0	0.0	0	115	07/05/80	32.0	05.2	6	F. GILA
504123190201	5	34.43	5	0.0	0	0.0	0	115	07/13/80	31.5	03.5	3	F. GILA
504123190201	1	37.0	1	0.0	0	0.0	0	25	06/14/80	31.0	08.0	4	F. GILA

TAXON NUMBER	END	PHYLOGENETIC SORT OF 2500+ FISH DATA BY TAXON, STATION, AND DATE										NO. OF GENUS INITIAL AND SPECIES NAME	04214744				
		TOTAL	SIZE	NO.	END	SIZE	NO.	END	SIZE	NO.	END	DATE	TEMP	SAL	SAL		
	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	NO. DAY	HR	TOP C	BOTTOM		
504123190203	50	30-40	43	41.58	7	0	0	0	25	06/21/8	29.9	11.2	R	F.GULIA			
504123190203	21	40-51	23	0-0	0	0	0	0	25	06/28/8	34.0	02.5	7	F.GULIA			
504123190203	13	47-49	13	0-0	0	0	0	0	25	07/05/8	32.0	05.5	3	F.GULIA			
504123190203	14	36-0	3	48.58	4	0	0	0	25	07/13/8	32.5	02.2	9	F.GULIA			
504123190203	8	32-44	8	0-0	0	0	0	0	27	06/21/8	29.5	11.2	4	F.GULIA			
504123190203	11	31-34	3	37.50	8	0	0	0	27	06/28/8	31.2	05.5	10	F.GULIA			
504123190203	6	35-37	1	40.45	2	53.0	1	27	07/05/8	32.0	02.2	R	F.GULIA				
504123190203	1	32-0	1	0-0	0	0	0	0	35	06/14/8	32.0	10.5	5	F.GULIA			
504123190203	1	44-0	1	0-0	0	0	0	0	35	06/21/8	29.0	00.2	4	F.GULIA			
504123190203	4	38-39	1	45.0	1	44.55	4	35	07/13/8	32.0	02.5	R	F.GULIA				
504123190203	4	40-44	2	55.82	2	0	0	0	45	06/21/8	29.5	02.2	R	F.GULIA			
504123190203	7	30-50	7	0-6	0	0	0	0	45	06/28/8	30.2	02.2	6	F.GULIA			
504123190203	10	33-51	10	0-0	0	0	0	0	45	07/05/8	32.0	03.0	7	F.GULIA			
504123190203	7	32-36	3	42.49	4	0	0	0	45	07/13/8	31.5	02.2	9	F.GULIA			
504123190203	12	30-38	12	0-0	0	0	0	0	47	06/21/8	29.5	02.2	14	F.GULIA			
504123190203	1	35-0	1	0-0	0	0	0	0	47	06/28/8	30.8	02.0	15	F.GULIA			
504123190203	1	18-0	1	0-0	0	0	0	0	47	07/13/8	31.2	00.5	9	F.GULIA			
504123190203	7	30-0	1	37.50	5	43.0	1	45	06/14/8	32.0	15.0	10	F.GULIA				
504123190203	11	35-45	11	0-0	0	0	0	0	45	06/21/8	30.2	11.0	10	F.GULIA			
504123190203	28	34-50	28	0-0	0	0	0	0	45	06/28/8	32.0	02.0	9	F.GULIA			
504123190203	6	19-54	4	0-0	0	0	0	0	45	07/05/8	32.0	02.8	12	F.GULIA			
504123190203	19	38-55	19	0-0	0	0	0	0	45	07/13/8	33.0	03.0	4	F.GULIA			
504123190203	2	39-43	2	0-0	0	0	0	0	57	06/21/8	30.0	08.0	9	F.GULIA			
504123190203	81	32-48	81	0-0	0	0	0	0	57	06/28/8	31.0	05.5	11	F.GULIA			
504123190203	3	49-0	1	50.0	1	51.0	1	57	07/05/8	32.0	00.0	13	F.GULIA				
504123190203	5	41-49	2	59.60	2	58.0	1	45	06/21/8	29.5	13.0	4	F.GULIA				
504123190203	47	31-47	47	0-0	0	0	0	0	45	06/28/8	31.0	04.0	10	F.GULIA			
504123190203	10	42-60	3	70.80	3	85.92	4	47	06/14/8	31.5	26.5	R	F.GULIA				
504123190203	41	33-67	41	0-0	0	0	0	0	47	06/21/8	00.0	00.0	11	F.GULIA			
504123190203	47	30-48	8	40.43	29	45.63	10	47	06/28/8	31.5	04.5	R	F.GULIA				
504123190203	2	50-53	2	0-0	0	0	0	0	47	07/05/8	31.0	05.5	7	F.GULIA			
504123190203	8	43-70	8	0-0	0	0	0	0	67	07/13/8	31.0	04.0	6	F.GULIA			
504123190203	6	27-29	6	0-0	0	0	0	0	75	06/15/8	30.0	32.0	11	F.GULIA			
504123190203	2	44-0	2	0-0	0	0	0	0	75	06/20/8	30.5	34.0	11	F.GULIA			
504123190203	20	30-40	20	0-0	0	0	0	0	75	06/29/8	32.5	12.0	15	F.GULIA			
504123190203	25	24-28	5	35.42	20	0	0	0	75	07/04/8	32.0	11.0	11	F.GULIA			
504123190203	4	33-42	8	0-0	0	0	0	0	75	07/14/8	30.5	22.0	18	F.GULIA			
504123190203	1	53-0	1	0-0	0	0	0	0	77	06/14/8	30.2	31.0	3	F.GULIA			
504123190203	147	31-50	147	0-0	0	0	0	0	77	06/21/8	29.6	12.0	6	F.GULIA			
504123190203	11	40-49	11	0-0	0	0	0	0	77	06/28/8	30.0	16.0	5	F.GULIA			
504123190203	19	35-41	6	45.56	8	49.20	5	77	07/05/8	30.2	08.0	4	F.GULIA				
504123190203	7	40-45	5	54.62	2	0	0	0	77	07/13/8	30.0	14.0	4	F.GULIA			
504123190203	16	35-72	16	0-0	0	0	0	0	95	06/20/8	32.0	36.0	9	F.GULIA			
504123190203	52	21-45	49	55.58	3	0	0	0	95	06/29/8	34.5	25.5	15	F.GULIA			
504123190203	14	22-50	18	0-0	0	0	0	0	95	07/04/8	32.5	25.0	11	F.GULIA			
504123190203	13	14-0	1	27.46	12	0	0	0	95	07/14/8	31.0	24.0	14	F.GULIA			
504123190203	1	55-0	1	0-0	0	0	0	0	95	06/16/8	30.0	33.0	18	F.GULIA			
504123190203	5	10-62	5	0-0	0	0	0	0	95	06/20/8	30.0	35.0	20	F.GULIA			
504123190203	13	29-32	5	35.42	6	56.0	2	95	06/29/8	32.5	14.5	13	F.GULIA				
504123190203	19	34-55	19	0-0	0	0	0	0	95	07/04/8	33.0	16.0	17	F.GULIA			
504123190203	16	34-46	3	40.41	9	46.50	1	95	07/12/8	31.0	15.5	18	F.GULIA				
504123190203	11	34-70	11	0-0	0	0	0	0	105	06/15/8	31.2	32.0	7	F.GULIA			
504123190203	1	31-0	1	0-0	0	0	0	0	105	06/20/8	31.2	36.0	14	F.GULIA			
504123190203	17	31-48	16	45-0	1	0	0	0	105	06/27/8	30.0	16.0	20	F.GULIA			

TAXON NUMBER	PHYLOGENETIC SORT OF 2500CS FISH DATA BY TAXON, STATION, AND DATE.										04/14/80 NO. OF GENUS INITIAL AND SPECIES NAME	
	TOTAL SIZE	IND. NO.	IND. CLASSI	SIZE	IND. NO.	IND. CLASSI	SIZE	IND. NO.	IND. CLASSI	SIZE		
508123190203	7	30	32	2	15	51	5	0	0	0	105	07/14/80 27.0 35.8
508123190203	8	36	42	5	47	0	3	72	0	1	105	07/14/80 31.4 26.0
508123190203	4	34	50	4	0	0	0	0	0	0	115	06/28/80 30.5 02.2
508123190203	8	30	36	4	47	65	3	54	0	1	115	07/05/80 37.8 04.2
508123190203	5	39	58	5	0	0	0	0	0	0	115	07/13/80 32.8 02.2
508123200210	1	31	0	1	0	0	0	0	0	0	75	06/20/80 30.5 34.0
508123200210	2	21	34	2	0	0	0	0	0	0	75	06/20/80 32.5 12.0
508123200210	1	45	0	1	0	0	0	0	0	0	75	07/14/80 30.5 27.2
508123200210	1	13	0	1	0	0	0	0	0	0	85	06/15/80 32.5 33.8
508123200210	3	12	0	1	16	17	2	0	0	0	85	06/20/80 32.2 36.0
508123200210	9	14	20	4	25	27	4	34	0	1	85	07/04/80 32.5 25.0
508123200210	12	3	21	11	34	0	1	0	0	0	85	07/14/80 31.8 28.2
508123200210	1	32	0	1	0	0	0	0	0	0	95	06/14/80 30.8 33.0
508123200210	1	36	0	1	0	0	0	0	0	0	95	06/20/80 30.0 35.0
508123200210	2	36	37	2	0	0	0	0	0	0	95	06/29/80 32.5 14.5
508123200210	3	14	24	2	32	0	1	0	0	0	105	06/27/80 30.0 16.2
508123200210	1	20	0	1	0	0	0	0	0	0	105	07/14/80 31.8 26.0
508123200301	7	34	36	1	41	0	2	45	0	2	95	06/14/80 30.8 07.6
508123200301	2	45	0	1	55	0	1	0	0	0	95	06/21/80 30.2 11.0
508123200301	16	30	33	5	35	50	5	0	0	0	75	06/15/80 30.0 32.2
508123200301	3	36	0	1	0	0	0	0	0	0	75	06/20/80 30.5 34.0
508123200301	7	42	54	7	0	0	0	0	0	0	75	06/29/80 32.5 22.0
508123200301	12	41	0	1	44	0	2	55	55	4	75	07/04/80 32.0 21.0
508123200301	15	44	68	15	0	0	0	0	0	0	75	07/14/80 30.5 22.2
508123200301	3	36	42	4	0	0	0	0	0	0	75	07/15/80 32.5 33.8
508123200301	2	42	41	2	0	0	0	0	0	0	85	06/20/80 32.2 16.0
508123200301	4	44	47	2	54	58	2	0	0	0	85	06/29/80 34.5 25.5
508123200301	1	59	0	1	0	0	0	0	0	0	85	07/14/80 31.8 28.2
508123200301	11	31	35	4	38	42	5	48	50	2	95	06/16/80 30.8 30.0
508123200301	26	27	36	10	41	54	10	0	0	0	95	06/20/80 30.0 35.0
508123200301	1	40	0	1	0	0	0	0	0	0	95	06/29/80 32.5 14.5
508123200301	1	59	0	1	0	0	0	0	0	0	95	07/04/80 31.0 16.0
508123200301	1	50	0	1	0	0	0	0	0	0	95	07/12/80 31.0 15.5
508123200301	2	36	45	7	0	0	0	0	0	0	95	06/20/80 31.2 36.0
508123200301	2	46	58	2	0	0	0	0	0	0	105	06/27/80 30.0 16.2
508123200301	1	59	0	1	0	0	0	0	0	0	95	07/14/80 31.8 26.0
508123200301	1	50	0	1	0	0	0	0	0	0	105	07/14/80 31.2 06.0
508123200301	2	26	53	2	0	0	0	0	0	0	115	06/21/80 31.2 06.0
5081232010101	14	10	12	15	200	0	1	0	0	0	115	06/21/80 31.0 03.2
5081232010101	1	230	0	1	0	0	0	0	0	0	115	07/05/80 31.2 04.5
5081232010101	1	195	0	1	0	0	0	0	0	0	21	06/21/80 29.5 11.2
5081232010101	1	250	0	1	0	0	0	0	0	0	21	06/28/80 31.2 05.5
5081232010101	1	230	0	1	0	0	0	0	0	0	21	07/12/80 31.5 02.0
5081232010101	2	270	40	2	0	0	0	0	0	0	4T	06/14/80 32.0 14.0
5081232010101	1	245	0	1	0	0	0	0	0	0	4T	06/21/80 29.5 02.2
5081232010101	1	240	0	1	0	0	0	0	0	0	4T	06/28/80 30.0 02.0
5081232010101	2	280	0	1	405	0	1	0	0	0	7T	06/21/80 29.6 12.2
5081232010101	2	230	0	1	130	50	2	0	0	0	7T	06/28/80 30.0 16.2
5081232010101	1	25	0	1	0	0	0	0	0	0	95	06/16/80 30.0 33.0
5081232010302	5	27	39	5	0	0	0	0	0	0	85	06/15/80 32.5 33.8
5081232010302	21	28	38	21	0	0	0	0	0	0	105	06/20/80 31.2 36.0
5081232010302	14	33	42	18	0	0	0	0	0	0	105	06/27/80 30.0 16.2
5081232010401	1	120	0	1	0	0	0	0	0	0	95	06/21/80 30.0 08.0
5081232010401	1	75	0	1	0	0	0	0	0	0	95	07/04/80 31.0 05.5
5081232010401	1	60	0	1	4	0	0	0	0	0	75	06/15/80 30.0 32.2

TAXON NUMBER	PHYLUMNETIC SORT OF 2500CS FISH DATA BY TAXON, STATION, AND DATE.										NO. OF GENUS INITIAL AND SPECIES SPECIES NAME				
	TOTAL IND	SIZE CLASSI	NO. IND CLASSI	DATE MO DAY YR	TEMP C	SAL TOP	SAL BOTTON								
508123210401	3	49	0	1	58	0	1	95	0	3	75	06/20/84	30.5	34.0	13 L. PHOMROIDES
508123210401	2	14	0	1	74	0	1	8	0	0	75	06/20/84	32.5	12.0	16 L. PHOMROIDES
508123210401	2	77	78	2	0	0	0	0	0	0	75	07/04/84	32.0	11.0	11 L. PHOMROIDES
508123210401	5	36	0	1	50	55	3	71	40	2	75	07/14/84	30.5	22.2	18 L. PHOMROIDES
508123210401	17	36	61	17	0	0	0	0	0	0	85	06/15/84	32.5	33.8	10 L. PHOMROIDES
508123210401	7	42	64	7	0	0	0	0	0	0	85	06/20/84	32.2	36.0	9 L. PHOMROIDES
508123210401	9	42	45	5	50	0	1	58	62	2	85	06/20/84	34.5	25.5	15 L. PHOMROIDES
508123210401	4	44	45	2	48	40	2	0	0	0	85	07/06/84	32.5	25.0	11 L. PHOMROIDES
508123210401	6	47	50	4	60	0	1	65	0	1	85	07/14/84	31.5	28.2	14 L. PHOMROIDES
508123210401	24	37	43	6	46	60	15	66	40	1	85	06/16/84	30.5	33.0	18 L. PHOMROIDES
508123210401	16	46	73	16	0	0	0	0	0	0	85	06/20/84	30.0	35.0	20 L. PHOMROIDES
508123210401	2	55	0	1	70	0	1	0	0	0	85	06/20/84	32.5	14.5	13 L. PHOMROIDES
508123210401	11	55	54	8	67	70	2	75	0	1	85	07/06/84	33.0	16.0	17 L. PHOMROIDES
508123210401	1	57	0	1	0	0	0	0	0	0	95	07/12/84	31.0	15.5	18 L. PHOMROIDES
508123210401	1	55	0	1	0	0	0	0	0	0	105	06/20/84	31.2	36.0	14 L. PHOMROIDES
508123210401	4	48	0	1	51	56	2	70	0	1	105	06/27/84	32.5	14.5	20 L. PHOMROIDES
508123210401	1	55	0	1	0	0	0	0	0	0	115	06/28/84	30.5	02.2	11 L. PHOMROIDES
508123220202	18	23	30	5	34	60	12	65	0	1	11	06/28/84	31.0	03.2	14 R. CHYSURA
508123220202	15	30	37	8	44	45	2	59	80	5	11	07/05/84	31.2	04.5	10 R. CHYSURA
508123220202	11	40	45	6	57	70	3	80	85	2	11	07/12/84	30.5	02.0	9 R. CHYSURA
508123220202	6	33	11	2	47	52	2	60	67	2	11	06/14/84	32.5	12.0	11 R. CHYSURA
508123220202	20	36	46	13	44	54	7	59	72	4	11	06/21/84	29.0	00.2	16 R. CHYSURA
508123220202	1	23	11	1	58	0	1	75	0	1	4T	06/24/84	10.8	02.0	16 R. CHYSURA
508123220202	54	73	44	14	50	91	41	155	0	1	4T	07/05/84	32.0	03.2	11 R. CHYSURA
508123220202	57	18	41	24	50	67	19	70	88	14	4T	07/12/84	31.2	00.5	9 R. CHYSURA
508123220202	1	16	0	1	0	0	0	0	0	0	55	06/14/84	32.5	15.0	10 R. CHYSURA
508123220202	1	33	0	1	0	0	0	0	0	0	AT	07/05/84	31.0	05.5	7 R. CHYSURA
508123220202	1	40	0	1	0	0	0	0	0	2	75	06/20/84	30.5	34.0	11 R. CHYSURA
508123220202	1	56	0	1	0	0	0	0	0	0	75	07/05/84	32.0	11.0	11 R. CHYSURA
508123220202	2	13	0	1	51	0	1	0	0	0	75	07/12/84	30.5	22.2	18 R. CHYSURA
508123220202	4	22	0	1	13	36	2	42	0	1	95	06/16/84	30.5	33.0	18 R. CHYSURA
508123220202	6	37	38	3	40	41	2	64	0	1	95	06/20/84	30.0	35.0	20 R. CHYSURA
508123220202	1	20	0	1	0	0	0	0	0	0	95	06/29/84	32.5	14.5	13 R. CHYSURA
508123220202	4	11	14	2	21	0	1	45	0	1	95	07/06/84	33.0	16.0	17 R. CHYSURA
508123220202	2	20	43	2	70	0	1	0	0	0	95	07/12/84	31.0	15.5	18 R. CHYSURA
508123220402	1	36	0	1	0	0	0	0	0	0	1T	06/24/84	30.8	01.8	10 C. NERULOSUS
508123220402	5	22	0	1	30	40	3	67	0	1	4T	06/28/84	30.8	02.0	16 C. NERULOSUS
508123220402	1	60	0	1	0	0	0	0	0	0	4T	07/05/84	32.0	03.2	11 C. NERULOSUS
508123220402	1	18	20	2	24	0	1	0	0	0	55	06/14/84	32.5	15.0	10 C. NERULOSUS
508123220402	1	43	0	1	0	0	0	0	0	0	65	07/05/84	32.8	02.8	12 C. NERULOSUS
508123220402	2	21	33	2	0	0	0	0	0	0	75	06/29/84	32.5	12.0	15 C. NERULOSUS
508123220402	2	21	24	2	0	0	0	0	0	0	75	07/14/84	30.5	22.2	18 C. NERULOSUS
508123220402	1	19	0	1	0	0	0	0	0	0	85	07/14/84	31.4	28.2	14 C. NERULOSUS
508123220402	1	16	0	1	0	0	0	0	0	0	95	06/16/84	30.8	33.0	18 C. NERULOSUS
508123220402	2	17	27	2	0	0	0	0	0	0	95	07/12/84	31.0	15.5	18 C. NERULOSUS
508123220404	5	47	0	3	61	81	4	275	0	1	1T	06/21/84	30.5	08.2	9 C. NOTHUS
508123220404	1	63	0	1	0	0	0	0	0	0	1T	07/12/84	30.5	02.0	9 C. NOTHUS
508123220404	9	67	73	2	74	81	5	104	0	2	3T	06/14/84	32.5	12.0	11 C. NOTHUS
508123220404	3	43	0	1	56	56	2	0	0	0	3T	06/21/84	29.0	00.2	16 C. NOTHUS
508123220404	6	190	0	1	0	0	0	0	0	0	4T	06/21/84	29.5	02.2	14 C. NOTHUS
508123220404	16	19	41	3	43	48	8	58	69	4	4T	07/05/84	32.0	03.2	11 C. NOTHUS
508123220404	11	47	54	18	65	0	1	0	0	0	4T	07/12/84	31.2	00.5	9 C. NOTHUS
508123220404	2	140	90	2	195	0	1	0	0	0	AT	06/21/84	00.0	00.0	11 C. NOTHUS
508123220406	1	57	0	1	0	0	0	0	0	0	1T	06/14/84	31.2	06.0	8 C. REGALIS

PAGE 14 GENUS-SPECIES TOTAL TAXON NUMBER	PHYLOGENETIC SORT OF 250ACES FISH DATA BY TAXON, STATION AND DATE*											04/14/80 NO. OF GENUS INITIAL AND SPECIES NAMES	
	TND	SIZE	NO.IND.	SIZE	NO.IND.	STATION	DATE	TEMP	SAL	SAL	NO. IND.		
	TND	CLASSI	CLASSII	CLASSIII	CLASSIV	CLASSV	NUMBER	MO/DAY/YR	TOP C	TOP			
504121220406	4	50	0	1	70	75	2	A3	0	1	3T	06/14/80 32.5 12.0	11 C.REGALIS
504123220406	1	63	0	3	6	0	0	0	0	0	3T	06/21/80 29.0 00.2	16 C.REGALIS
504123220406	1	79	0	1	6	0	0	0	0	0	4T	06/21/80 29.5 02.2	14 C.REGALIS
504123220406	19	33	47	14	50	0	1	A2101	4	4T	06/28/80 30.8 02.0	16 C.REGALIS	
504123220406	1	715	0	1	6	0	0	0	0	0	4T	07/05/80 32.0 03.2	13 C.REGALIS
504123220406	1	235	0	1	6	0	0	0	0	0	3T	06/21/80 30.0 08.0	9 C.REGALIS
504123220406	1	133	0	1	6	0	0	0	0	0	3T	06/14/80 32.5 12.0	11 L.YANTHURUS
504123220406	1	105	0	1	6	0	0	0	0	0	3T	07/05/80 33.8 01.5	5 L.YANTHURUS
504123220406	1	205	0	1	6	0	0	0	0	0	4T	06/21/80 00.0 00.0	11 M.AMERICANUS
504123221001	11	32	45	3	54	15	6	176230	4	1T	06/14/80 31.2 06.0	8 M.UNDULATUS	
504123221001	5	34	41	2	51	0	1	210380	2	1T	06/21/80 30.5 08.2	9 M.UNDULATUS	
504123221001	1	75	0	1	6	0	0	0	0	0	1T	06/28/80 31.0 03.2	14 M.UNDULATUS
504123221001	1	710	0	1	6	0	0	0	0	0	2T	07/05/80 31.2 04.5	10 M.UNDULATUS
504123221001	6	65	0	1	105110	2	260265	2	1T	07/12/80 30.5 02.0	9 M.UNDULATUS		
504123221001	2	243275	2	6	0	0	0	0	0	0	2T	06/21/80 29.5 11.2	8 M.UNDULATUS
504123221001	24	38	75	19	105150	5	176200	2	3T	06/14/80 32.5 12.0	11 M.UNDULATUS		
504123221001	6	58	62	3	125	0	1	186210	2	3T	06/21/80 29.0 00.2	16 M.UNDULATUS	
504123221001	19	58	83	12	140155	4	186210	3	3T	06/28/80 30.5 02.0	7 M.UNDULATUS		
504123221001	3	77	73	2	135	0	1	0	0	0	3T	07/05/80 33.8 01.5	5 M.UNDULATUS
504123221001	14	41	0	1	70	10	11	145210	2	3T	07/12/80 31.2 00.5	11 M.UNDULATUS	
504123221001	1	193	0	1	6	0	0	0	0	0	4T	06/14/80 32.0 14.0	8 M.UNDULATUS
504123221001	2	52	0	1	220	0	1	0	0	0	4T	06/21/80 29.5 02.2	14 M.UNDULATUS
504123221001	29	50	45	22	130180	5	260	0	1	4T	06/28/80 30.8 02.0	16 M.UNDULATUS	
504123221001	14	63	0	1	70	48	8	186230	5	4T	07/05/80 32.0 03.2	11 M.UNDULATUS	
504123221001	15	41	70	2	76	98	6	175195	2	4T	07/12/80 31.2 00.5	9 M.UNDULATUS	
504123221001	7	130	0	3	140150	2	186250	2	5T	06/21/80 30.0 08.0	9 M.UNDULATUS		
504123221001	1	120	0	3	6	0	0	0	0	5T	06/28/80 31.0 05.5	11 M.UNDULATUS	
504123221001	2	56	0	2	6	0	0	0	0	5T	07/05/80 32.2 00.0	13 M.UNDULATUS	
504123221001	1	140	0	1	6	0	0	0	0	5T	07/12/80 31.2 05.0	8 M.UNDULATUS	
504123221001	7	40	90	2	135150	3	170240	2	6T	06/14/80 31.5 24.5	8 M.UNDULATUS		
504123221001	14	145150	6	159165	3	145205	5	6T	06/21/80 00.0 00.0	11 M.UNDULATUS			
504123221001	25	27	44	15	73	99	8	186200	2	6T	06/28/80 31.5 04.5	8 M.UNDULATUS	
504123221001	9	71	34	2	76	97	6	145150	3	6T	07/05/80 31.0 05.5	7 M.UNDULATUS	
504123221001	1	158	0	1	6	0	0	0	0	6T	07/12/80 31.0 04.0	9 M.UNDULATUS	
504123221001	1	280	0	1	6	0	0	0	0	1T	06/21/80 30.5 08.2	9 P.CROMIS	
504123221401	1	110	0	1	6	0	0	0	0	0	3S	07/05/80 33.2 01.5	10 S.OCCELLATA
504123221401	1	114	0	1	6	0	0	0	0	0	3S	07/11/80 32.8 02.5	8 S.OCCELLATA
504123230302	1	42	0	1	6	0	0	0	0	0	1S	07/14/80 31.8 26.0	14 S.OCCELLATUS
504123260101	1	17	0	1	6	0	0	0	0	0	4S	07/06/80 32.5 25.0	11 C.FARER
504123260101	2	4	15	2	6	0	0	0	0	0	1S	06/20/80 31.2 36.0	14 C.FARER
504123340400	1	31	0	1	6	0	0	0	0	0	4S	06/20/80 32.2 36.0	9 SPARISOMA SP.
504123340400	1	26	0	1	6	0	0	0	0	0	4S	06/29/80 34.5 26.5	15 SPARISOMA SP.
504123340400	2	4	10	2	6	0	0	0	0	0	4S	07/14/80 31.8 28.2	14 SPARISOMA SP.
504123340400	2	35	60	2	6	0	0	0	0	0	4S	06/16/80 30.8 33.0	18 SPARISOMA SP.
504123340400	1	21	25	2	6	0	0	3	0	0	4S	06/20/80 30.0 36.0	20 SPARISOMA SP.
504123340400	2	20	0	1	14	0	1	0	0	0	4S	07/12/80 33.0 16.0	17 SPARISOMA SP.
504123340400	4	10	19	2	34	40	2	0	0	0	4S	07/12/80 31.0 15.5	18 SPARISOMA SP.
504123350201	1	17	14	3	6	0	0	0	0	0	1S	06/21/80 29.8 10.0	9 M.CEPHALUS
504123350201	1	18	0	1	6	0	0	0	0	0	9S	07/12/80 31.0 15.5	14 M.CEPHALUS
504123350201	1	17	0	1	6	0	0	0	0	0	1S	06/21/80 31.2 36.0	14 M.CEPHALUS
504123350201	1	62	0	1	6	0	0	0	0	0	11S	06/21/80 29.0 00.2	8 M.CEPHALUS
504123350202	1	22	0	1	6	0	0	0	0	0	1S	06/14/80 31.2 07.8	7 M.CEPHALUS
504123350202	1	19	0	1	6	0	0	0	0	0	2S	07/13/80 32.5 02.2	9 M.CEPHALUS
504123350202	1	18	0	1	6	0	0	0	0	0	4S	06/21/80 30.2 11.0	10 M.CEPHALUS

PALEO MATERIAL SPECIES	TOTAL TAXON NUMBER	PHYSIOLOGIC SORT OF 2500CS FISH DATA BY TAXON, STATION, AND DATE.										NO. OF GENUS INITIAL AND SPECIES NAME	04/14/00			
		IND	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	STATION	DATE	TEMP	SAL	SAL	ROT/TOT		
		IND	CLASS	CLASS	CLASS	CLASS	CLASS	CLASS	NUMBER	MOL/DAY	YR	TOP C	TOP	ROT/TOT		
508123350202	2	18	26	2	0	0	0	0	6	0	75	07/06/8	32.0	11.0	11	M.CUREMA
508123350202	2	15	16	2	0	0	0	0	0	0	75	07/14/8	30.5	22.2	18	M.CUREMA
508123360102	3	44	0	1	0	0	0	0	0	0	75	06/14/8	31.2	07.8	7	S.BARRACUDA
508123360102	1	105	0	1	0	0	0	0	0	0	75	07/05/8	32.0	02.2	8	S.BARRACUDA
508123360102	3	21	0	1	45	48	2	0	0	0	55	06/14/8	32.5	15.0	10	S.BARRACUDA
508123360102	1	105	0	1	0	0	0	0	0	0	55	06/28/8	32.0	02.0	9	S.BARRACUDA
508123360102	1	43	0	1	0	0	0	0	0	0	55	07/05/8	32.8	02.8	12	S.BARRACUDA
508123360102	1	40	0	1	0	0	0	0	0	0	45	07/05/8	32.5	04.2	9	S.BARRACUDA
508123360102	1	46	0	1	0	0	0	0	0	0	75	06/15/8	30.0	32.2	11	S.BARRACUDA
508123360102	1	108	0	1	0	0	0	0	0	0	75	06/20/8	30.5	34.0	11	S.BARRACUDA
508123360102	5	24	0	2	27	24	2	67	0	1	75	06/29/8	32.5	12.0	15	S.BARRACUDA
508123360102	2	20	24	2	0	0	0	0	0	0	75	07/06/8	32.0	11.0	11	S.BARRACUDA
508123360102	7	19	25	4	34	0	1	46	49	2	75	07/14/8	30.5	22.2	18	S.BARRACUDA
508123360102	1	26	0	1	0	0	0	0	0	0	45	06/15/8	32.5	13.8	10	S.BARRACUDA
508123360102	4	18	0	2	21	32	2	0	0	0	45	07/14/8	31.0	28.2	14	S.BARRACUDA
508123360102	2	16	0	2	0	0	0	0	0	0	95	06/16/8	30.8	33.0	18	S.BARRACUDA
508123360102	1	74	0	1	0	0	0	0	0	0	95	07/06/8	33.0	16.0	17	S.BARRACUDA
508123360102	3	19	25	3	0	0	0	0	0	0	105	06/27/8	30.0	16.2	20	S.BARRACUDA
508123360102	1	16	0	1	14	19	2	0	0	0	105	07/14/8	31.0	26.0	14	S.BARRACUDA
508123360102	1	41	0	1	0	0	0	0	0	0	115	06/15/8	32.5	08.0	6	S.BARRACUDA
508123420101	1	29	0	1	0	0	0	0	0	0	105	07/06/8	27.0	35.8	8	B.CROSSATUS
508123441007	1	57	0	1	0	0	0	0	0	0	45	06/20/8	32.2	36.0	9	I.NUCHIPINNIS
508123441007	1	50	0	1	0	0	0	0	0	0	95	06/14/8	30.8	33.0	18	I.NUCHIPINNIS
508123560400	1	20	0	1	0	0	0	0	0	0	45	07/14/8	31.0	28.2	14	ORY UNKNOWN
508123560403	1	69	0	1	0	0	0	0	0	0	55	07/05/8	32.8	02.8	12	A.SOPORATOR
508123560403	1	13	0	1	0	0	0	0	0	0	65	07/13/8	32.0	07.0	5	A.SOPORATOR
508123560403	1	22	0	1	0	0	0	0	0	0	75	06/15/8	30.0	33.2	11	A.SOPORATOR
508123560403	1	10	0	1	0	0	0	0	0	0	45	06/29/8	34.5	25.5	15	A.SOPORATOR
508123550403	5	12	0	1	19	0	2	23	24	2	45	07/14/8	31.0	28.2	14	A.SOPORATOR
508123560403	2	40	55	2	0	0	0	0	0	0	95	06/16/8	30.8	33.0	18	A.SOPORATOR
508123560403	5	45	64	3	51	58	2	0	0	0	95	06/29/8	32.5	14.5	13	A.SOPORATOR
508123560403	7	10	0	1	13	24	3	45	55	3	95	07/12/8	31.0	15.5	18	A.SOPORATOR
508123560403	1	41	0	1	0	0	0	0	0	0	105	06/27/8	32.5	14.5	20	A.SOPORATOR
508123561401	1	19	0	1	0	0	0	0	0	0	45	07/17/8	31.5	02.2	8	G.BOLEFOSMA
508123561401	3	33	0	1	0	0	0	0	0	0	45	06/15/8	32.5	33.0	10	G.BOLEFOSMA
508123561401	1	16	0	1	0	0	0	0	0	0	45	06/29/8	34.5	25.5	15	G.BOLEFOSMA
508123561401	1	35	0	1	0	0	0	0	0	0	95	06/16/8	30.8	33.0	18	G.BOLEFOSMA
508123561401	2	22	31	2	0	0	0	0	0	0	95	06/20/8	30.0	35.0	20	G.BOLEFOSMA
508123561401	1	38	0	1	0	0	0	0	0	0	95	06/29/8	32.5	14.5	13	G.BOLEFOSMA
508123561401	1	31	0	1	0	0	0	0	0	0	95	07/12/8	31.0	15.5	18	G.BOLEFOSMA
508123561404	1	55	0	1	0	0	0	0	0	0	95	06/16/8	30.8	33.0	18	G.SHARAGOUS
508123561501	1	14	0	1	0	0	0	0	0	0	25	06/21/8	29.0	11.2	8	G.ROSCII
508123561501	1	11	0	1	0	0	0	0	0	0	35	06/14/8	32.0	10.5	5	G.ROSCII
508123561501	2	12	16	2	0	0	0	0	0	0	35	07/05/8	33.2	01.5	10	G.ROSCII
508123561501	1	23	0	1	0	0	0	0	0	0	45	07/05/8	32.0	03.0	9	G.ROSCII
508123561501	1	24	0	1	0	0	0	0	0	0	45	07/13/8	31.5	02.2	8	G.ROSCII
508123561501	1	24	0	1	0	0	0	0	0	0	47	06/21/8	29.5	02.2	14	G.ROSCII
508123561501	3	20	11	2	16	0	1	0	0	0	55	06/14/8	32.5	15.0	10	G.ROSCII
508123562302	2	25	28	2	0	0	0	0	0	0	25	06/14/8	31.0	08.0	6	M.GULOSUS
508123562302	7	10	11	4	14	19	2	35	0	1	75	07/05/8	33.2	01.5	10	M.GULOSUS
508123562302	1	29	0	1	0	0	0	0	0	0	35	07/13/8	32.0	02.5	8	M.GULOSUS
508123670409	1	62	0	1	0	0	0	0	0	0	105	06/20/8	31.2	36.0	14	S.GRANDICORNIS
508124010406	2	68	0	1	101	0	1	0	0	0	17	06/28/8	31.0	03.2	14	C.SPILOPTERUS
508124010406	3	66	0	1	72	73	2	0	0	0	37	06/21/8	29.0	00.2	16	C.SPILOPTERUS

TAXON NUMBER	IND.	PHYLOGENETIC SORT OF 2500CS FISH DATA BY TAXON, STATION, AND DATE.										NO. OF GENUS INITIAL AND SPECIES NAME	06/16/80			
		TOTAL SIZE NO. INO.	SIZE NO. INO.	SIZE NO. INO.	SIZE NO. INO.	STATION	DATE	TEMP	SAL	SAL	NO. OF GENUS INITIAL AND SPECIES NAME					
504124010406	2	44	0	1	45	0	1	0	0	0	3T	06/28/8	30.5	02.0	7	C. SPILOPTERUS
504124010406	1	57	0	1	0	0	0	0	0	0	3T	07/12/8	31.2	00.5	11	C. SPILOPTERUS
504124010406	1	42	0	1	0	0	0	0	0	0	4T	06/14/8	32.0	14.0	8	C. SPILOPTERUS
504124010406	2	33	0	1	42	0	1	95	0	1	4T	06/21/8	29.5	02.2	14	C. SPILOPTERUS
504124010406	1	58	0	1	0	0	0	0	0	0	4T	06/29/8	30.0	02.0	16	C. SPILOPTERUS
504124010406	3	54	0	1	64	0	1	75	0	1	5S	07/05/8	32.0	02.0	12	C. SPILOPTERUS
504124010406	2	36	48	2	0	0	0	0	0	0	5T	06/28/8	31.0	05.5	11	C. SPILOPTERUS
504124010406	1	42	0	1	0	0	0	0	0	0	5T	07/05/8	32.0	00.0	13	C. SPILOPTERUS
504124010406	1	43	0	1	0	0	0	0	0	0	6S	07/05/8	32.0	04.2	9	C. SPILOPTERUS
504124010406	1	63	0	1	0	0	0	0	0	0	6T	06/21/8	00.0	00.0	11	C. SPILOPTERUS
504124010406	1	55	0	1	0	0	0	0	0	0	6T	06/28/8	31.5	04.5	8	C. SPILOPTERUS
504124010406	1	55	0	1	0	0	0	0	0	0	7S	06/20/8	30.0	35.0	20	C. SPILOPTERUS
504124010406	3	74	0	1	0	0	0	0	0	0	10S	07/14/8	31.0	24.0	14	C. SPILOPTERUS
504124010406	1	53	0	1	0	0	0	0	0	0	7T	06/21/8	29.0	12.2	6	F. CROSSLATUS
504124030101	3	27	0	1	32	36	2	0	0	0	1T	06/28/8	31.0	03.2	14	A. LTNFATUS
504124030101	1	21	0	1	30	0	2	0	0	0	1T	07/12/8	30.5	02.0	9	A. LTNFATUS
504124030101	1	22	0	1	0	0	0	0	0	0	1T	07/12/8	31.2	00.5	11	A. LTNFATUS
504124030101	1	14	0	1	0	0	0	0	0	0	4S	06/14/8	32.0	15.0	10	A. LTNFATUS
504124030101	1	20	0	1	0	0	0	0	0	0	5S	07/05/8	32.0	02.0	12	A. LTNFATUS
504124030101	2	22	27	2	0	0	0	0	0	0	5T	07/05/8	32.0	00.0	13	A. LTNFATUS
504124030102	3	40	0	1	65	82	2	0	0	0	1T	06/28/8	31.0	03.2	14	T. MACULATUS
504124030102	1	41	0	1	0	0	0	0	0	0	1T	07/05/8	31.2	04.5	10	T. MACULATUS
504124030102	7	39	41	4	45	50	3	0	0	0	1T	07/12/8	30.5	02.0	9	T. MACULATUS
504124030302	1	76	0	1	0	0	0	0	0	0	3T	06/14/8	32.0	12.0	11	T. MACULATUS
504124030302	1	80	0	1	0	0	0	0	0	0	7T	06/21/8	29.0	00.2	16	T. MACULATUS
504124030302	1	75	0	1	0	0	0	0	0	0	7T	06/28/8	30.5	02.0	7	T. MACULATUS
504124030302	1	118	0	1	0	0	0	0	0	0	3T	07/12/8	31.2	00.5	11	T. MACULATUS
504125020500	1	7	0	1	0	0	0	0	0	0	7S	07/14/8	30.5	22.2	16	M. MONACANT-HUS SP.
504125020502	1	11	17	2	24	0	1	0	0	0	5S	06/21/8	30.2	11.0	10	M. HISPIOUS
504125020502	1	411	2	21	0	1	0	0	0	0	7S	06/20/8	30.5	34.0	11	M. HISPIOUS
504125020502	1	8	9	1	0	0	0	0	0	0	4S	07/06/8	32.0	25.0	11	M. HISPIOUS
504125020502	1	15	0	1	0	0	0	0	0	0	4S	06/20/8	30.0	35.0	20	M. HISPIOUS
504125030105	1	19	0	1	0	0	0	0	0	0	4S	06/29/8	34.5	25.5	15	L. TRIODUTTER
504125030105	1	15	4	1	0	0	0	0	0	0	4S	07/14/8	31.0	28.2	14	L. TRIODUTTER
504125030105	1	19	0	1	0	0	0	0	0	0	4S	07/12/8	31.0	15.5	18	L. TRIODUTTER
504125030105	1	9	0	1	0	0	0	0	0	0	10S	06/20/8	31.2	36.0	14	L. TRIODUTTER
504125030105	1	9	0	1	0	0	0	0	0	0	10S	07/06/8	27.0	35.8	8	L. TRIODUTTER
504125030105	2	20	0	1	29	0	1	0	0	0	10S	07/14/8	31.0	26.0	14	L. TRIODUTTER
504125040304	1	7	0	1	0	0	0	0	0	0	7S	06/29/8	32.0	12.0	15	S. NEPHELUS
504125040304	1	78	0	1	0	0	0	0	0	0	9S	07/06/8	33.0	16.0	17	S. NEPHELUS
504125040304	2	150	0	2	0	0	0	0	0	0	7T	06/28/8	31.2	05.5	10	S. TESTUDINEUS
504125040304	1	80	0	1	0	0	0	0	0	0	3S	06/14/8	32.0	10.5	5	S. TESTUDINEUS
504125040304	2	74	0	1	88	0	1	0	0	0	5S	06/21/8	30.2	11.0	10	S. TESTUDINEUS
504125040304	1	80	0	1	0	0	0	0	0	0	6S	07/05/8	32.0	04.2	9	S. TESTUDINEUS
504125040304	1	135	0	1	0	0	0	0	0	0	7S	06/29/8	32.0	12.0	15	S. TESTUDINEUS
504125040304	1	65	0	1	0	0	0	0	0	0	7S	07/14/8	30.5	22.2	18	S. TESTUDINEUS
504125040304	2	180	0	2	0	0	0	0	0	0	9S	06/16/8	30.0	33.0	18	S. TESTUDINEUS
504125040304	2	140	0	2	0	0	0	0	0	0	9S	06/20/8	30.0	35.0	20	S. TESTUDINEUS
504125040304	2	140	0	2	0	0	0	0	0	0	9S	06/16/8	30.0	33.0	18	S. TESTUDINEUS
504125040304	2	140	0	2	0	0	0	0	0	0	9S	06/20/8	30.0	35.0	20	S. TESTUDINEUS
504125040304	1	180	0	1	0	0	0	0	0	0	10S	06/20/8	31.2	36.0	14	S. TESTUDINEUS
504125040304	2	135	0	2	0	0	0	0	0	0	10S	06/27/8	32.0	14.5	20	S. TESTUDINEUS
504125050103	1	39	0	1	0	0	0	0	0	0	7S	06/20/8	30.5	34.0	11	C. ANTILLARUM
504125050105	1	43	0	1	0	0	0	0	0	0	2T	06/28/8	31.2	05.5	10	C. SCHOPFII
504125050105	2	45	0	1	45	0	1	0	0	0	7S	07/14/8	30.5	22.2	18	C. SCHOPFII
504125050105	1	60	0	1	0	0	0	0	0	0	4S	06/16/8	30.0	33.0	18	C. SCHOPFII

